Subject Leader Planning Grid.

Subject: Science **Subject leader: Charlotte Snape**

Enquiry Types

To ensure the complete coverage of working scientifically skills, there is a variety of different enquiry types for each year group. These will be shared with the children and their purpose and outcome discussed. The symbols will be used to show the children which type they are conducting on working walls as well as in books. There are 6 main types of enquiry and the colour correspond to the colour seen below in the curriculum map:

Comparative/fair testing	Research	Observation over time	Pattern seeking	Identifying/organising and classifying	Problem solving
					

Within these enquiry types, there are 7 enquiry skills. Not all of these skills will be recorded or completed for every experiment or lesson. It is expected that there is an element of practical learning and written learning in every lesson, however it will be noted in the lesson and in books which skill they are focusing on. The children will have experiences of all skill types and a variety of evidence to support this within their books. At Moorhill, we want the children to show progression within their disciplinary skills, so we have created our own progression and expectations for each year group. You will find this at the bottom of this document.

Asking questions	Making predictions	Setting up experiments	Observing and measuring	Recording data	Interpreting and communicating results	Evaluating
						

Scientist

To raise the science capital, each topic will have a link to a scientist and their job role. This will be shared with the children as either a focus for the lesson or as incidental learning. The premise behind this is to show the children all the possibilities in science and how they link to future careers.

Assessment

Children will be assessed based upon their working scientifically skills (skills as a scientist), as well as their substantive knowledge through the use of DC PRO. The bullets points for substantive knowledge relate to the statements on pupil asset and the numbers relate to the lessons/activities. The children will be teacher assessed with a 'best fit' model for each individual child at the end of each term. Percentages will not be used to limit children due to some terms having more substantive knowledge criteria or more than lend themselves to disciplinary knowledge. Children also complete a termly Head Start science assessment, which allows children to revisit subject areas. Children will be able to show their knowledge in a variety of ways and learning moments will be deepened to ensure the children retain their knowledge for further years.

Learning

Children at Moorhill will have science twice a week in their curriculum time and it is expected that any incidental learning is fostered to improve the children's working scientifically skills as well as their understanding that science is an integral part to everyday life both inside and outside of school.

Photographs

At Moorhill, we want science to include lots of practical opportunities for learning for our children. Due to this, photographs will be taken to show the child's learning in action and kept as evidence in their books. The children can use these to support them in their retention of knowledge as well as showcase their progression of science learning.

We are scientists

During the final stages of Summer term, children will complete a 'We are Scientists' unit of learning. These units are individual to year groups, and will be taught following analysis of teacher assessment and assessment outcomes. This unit will ensure children address gaps in their knowledge and address any misconceptions to ensure all children are ready for the following year's science curriculum.

<table>
<tr><th>Year</th><th>Skills as a scientist…</th><th>Substantive knowledge</th><th>Key Vocabulary</th></tr>
<tr><td>R</td><td colspan="3">Area of EYFS: Understanding the world
Links to Early Learning goals: The natural world Listening, attention and understanding Speaking Creating with materials Gross/fine motor skills Managing self</td></tr>
<tr><td></td><td>Enquiry types:
Explore
Investigate
Observe
Compare
Sort and classify
Problem solving

Enquiry skills:
Describe
Ask questions
Record
Draw conclusions
Measure
Make predictions</td><td colspan="2">Smart Scientist
Forces: Children will understand what magnets are for and what they do (Y3 forces and magnets).

<u>States of matter</u>: Carry out experiments to look at cause and effect: different liquids of egg shells (Y4 teeth), water when it freezes, chocolate when it is heated and ingredients when they are combined (all Y4 changing states) all of which will be revisited in further years.

<u>Plants:</u> Plant seeds that grow and comment on their changes. They will know what plants need to grow (Y1, Y2 plants).

<u>Animals including humans</u>: the 'soaperheroes program' (looking at germs and how they travel through contact (Y1, Y2 animals including humans link).

Link to literacy: Kipper's Snowy Day, The Big Freeze, Don't hog the hedge, Jack and the Beanstalk. Incidental teaching of their knowledge of the world will be given here.

Continuous provision opportunities: gloop, wet and dry sand, Magnetix, view finders in outdoor provision, magnifying glasses, water play, mud kitchen.</td></tr>
<tr><td>1A</td><td rowspan="2">I can observe closely, using simple equipment (incidental teaching with children's clothing for break times, Plants and hygiene topic).

I can perform simple tests. (which material would be best for a window?, when washing hands)

I can identify and classify (plant hunt activity, animal characteristics, animals diet activity)

I can ask simple questions and recognise that they can be answered in</td><td><u>Everyday Materials</u>
• Identify and name a variety of everyday materials including; wood, plastic, glass, water and rock.
• Distinguish (by grouping and classifying) between an object and the material which it is made such as scissors, paper, glass and pencils.
• Describe some of the physical properties of everyday materials. Use their senses to describe them (bendy, rough etc.).
• Compare and group together a variety of everyday materials on the basis of their simple physical properties. Plot on a Venn diagram.
Use this knowledge to decide which material would be best to create a window (link to History topic) and explain why.
Scientist: Romans (they were the first to have some form of glass window 100CE).</td><td><u>Everyday Materials</u>
Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through</td></tr>
<tr><td>1B</td><td><u>Seasonal Change</u>
• Observe changes across the four seasons.</td><td><u>Seasonal Change</u>
Weather (sunny, rainy, windy, snowy etc.) , Seasons (winter, summer, spring, autumn), Sun, sunrise, sunset, Day length</td></tr>
</table>

	different ways (this will be done in every lesson, prompting the children to ask the questions: how, why, what if) I can use my observations and ideas to suggest answers to questions I can gather and record data (using a table format) to help me answer questions (labelling, verbal post it notes written by adults, lunch box activity).	1. Know the four seasons by looking at the changes with trees, clothes and activities. What clothing changes are needed for each season? How do the plants change throughout the seasons? 2. Classifying cut out objects/equipment to show their understanding. 3. Observe changes across the four seasons through incidental teaching across the year and included in maths meetings. • Observe and describe weather associated with the seasons and how day length varies. Use table information about the amount of hours in seasons and days then to create pictogram from this information. **Scientist:** Rebecca Wood (Midlands Today weather presenter, show the children video clips of her presenting the weather. Can the children have a go at their own weather reports to be videoed?). Email her for advice on how to present the weather.	
1C		**Keeping Fit (topic due to community demographic)** Hygiene Handwashing – instructions explaining how to do it well. Create a song for handwashing and wash their own hands. What does being healthy mean? Give children a pre made lunch box. Which are the healthiest and why? Record ideas as a group about why things are healthy/unhealthy. Design a healthy lunchbox Write about what is in it and why you have chosen those foods. **Scientist:** Nutritionist (talk through that it is the job they are doing rather than a specific person). **Plants** • Identify and name a variety of common plants, including garden plants, wild plants and trees, and those classified as deciduous and evergreen. 1. Leaf hunt exploratory activity on KS2 site (www.woodlandtrust.org.uk – leaf ID sheet). 2. Observe growing plants within KS1 and identify their names. • Identify and describe the basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers. 1. Use a plant and dissect it to identify the parts with a variety of types. 2. Look at which plants grow from seed and which grow from a bulb, classify using real objects. **Scientist:** Beatrix Potter (found and drew 350 types of fungi, this began her journey into books as she was not allowed to present her science paper because she was a girl). **Animals Including Humans** • Name and identify common animals including fish, amphibians, reptiles, birds and mammals. Sorting pictures into groups based on their physical characteristics. • Name and identify carnivores, herbivores and omnivores. Looking at the animal's primary diet, Venn diagram pictures. Children to explain the difference. Children to visit the zoo to see the animals be fed. • Identify, name, draw and label the basic parts of the human body (eyes, nose, mouth, ears, hands, legs etc) Children to compare themselves against others (feet size etc.) and link parts to my senses (e.g. eyes to see, nose to smell etc.) and they are to go on a senses walk. • Compare the structure of a variety of comment animals including fish, amphibians, reptiles, birds, mammals and pets. Repeat above sorting activity but look at how the creatures a built and any similarities and differences. Challenge: why? **Scientist:** Zoologist, Marine biologist (talk about being that type of scientist when they are looking land and sea based animals)	**Keeping Fit (topic due to community demographic)** **hygiene, bacteria, soap, clean, healthy, balanced, diet, vegetables, meat, carbohydrates, dairy** **Plants** **Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud.** **Names of trees in the local area** **Names of garden and wild flowering plants in the local area.** **Animals Including Humans** **Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves** **Names of animals experienced first-hand from each vertebrate group**
2A		**Everyday Materials**	**Everyday Materials**

	I can ask simple questions and recognise that they can be answered in different ways (everyday materials, plants – experiment over time, how do germs spread) I can observe closely noticing changes overtime, using simple equipment (plants- using a variable) I can perform simple comparative tests (best materials for an umbrella, which is the best condition for a plant to grow)	• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching, including wood, metal, glass, brick, rock, paper and cardboard. 1. Recap what materials objects are made from using prior knowledge from year 1 activity. Use some objects with more than one material as a progression from Y1. 2. Organise and classify objects. • Identify and compare the suitability of a variety of everyday materials; including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses 1. Umbrella experiment. Children to look at the suitability of materials for an umbrella and why. Explain their hypothesis then test it out. IF time, the children could make one and test it outside. **Scientist:** Charles Macintosh (first person to invent the waterproof material).	Materials – wood, plastic, glass, metal, water, rock, brick, paper, fabric, card, rubber **Properties** – rough/smooth, flexible/rigid, strong/weak **reflective/non-reflective, transparent/translucent/opaque** **Changing Shape - squashing, bending, twisting and stretching, pushing and pulling**
2B	I can identify, group and classify (everyday materials, healthy eating, baby pictures, living things and their habitats) I can use my observations and ideas to suggest answers to questions (Evie's umbrella, plants, healthy eating) I can use different types of scientific enquiry to gather and record data to help me answer questions (compare and classify, observations over time, comparison) I can find things out using secondary sources (Planet Earth clips, BBC learning video clips)	**Plants** • Observe and describe how seeds and bulbs grow into mature plants 1. Recap Y1 knowledge on parts of the plant (roots, leaves, stem, flower). 2. Observe and describe how seeds and bulbs grow into mature plants (set up an experiment over time by planting a seed and watching it grow). Include write up of observations and show the life cycle of a plant. • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. 1. By using cress observe over time their growth and development with 4 different variables (1. light, 2. dark, 3. water, 4. oxygen). Focus on prediction with justifications. **Scientist:** Luther Burbank (his work on what plants need to thrive lead to his development of 800 types of plants including a spineless cactus that would feed cattle). **Animals Including Humans** • Find out and describe the basic needs of animals including humans for survival (food, water, cleanliness – link to following section, exercise). Describe the importance for humans of exercise, eating the right amount and type of food, and hygiene 1. Children to complete experiment, with exercise activities and comment on the changes to their body. 2. Describe the importance for humans of exercise, eating the right amounts of different types of food and hygiene: 3. Hygiene: link to reception's knowledge of washing hands write instructions. Then discuss how else germs could be spread. Use an aerosol to simulate a sneeze and comment of the spread of germs airborne. Use hair gel and glitter to investigate how germs spread. 4. Healthy eating: Open ended investigation (Carroll diagram) to identify ways to classify foods. Analyse a school dinner. Create a healthy pizza and explain their choices. Use the Change4Life website to look at healthy swaps – share with parents. • Notice that animals, including humans have offspring which grow into adults. 1. Use real life caterpillars in a habitat net in the classroom and observe over time the changes (record observations). 2. Match pictures of baby animals to adults, explain how they know. Use Planet Earth clips. 3. Using baby pictures of themselves, see if they can identify who they belong to and explain why. Identify key features that have remains the same. **Scientist:** David Attenborough (link to topic of Jungle Book, as well as his discoveries in the life cycles of animals).	**Plants** Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud. Names of trees in the local area Names of garden and wild flowering plants in the local area, **light, shade, sun, warm, cool, water, grow, healthy** **Animals Including Humans** **Survival, exercise, heart rate, blood, oxygen, protein**, carbohydrates, vegetables, dairy, fats, germs, **offspring,**
2C		**Living Things and Their Habitats** • Identify and name a variety of plants	**Living Things and Their Habitats** **Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats e.g. pond,**

		1. Using desert: cactus, woodland, arctic, rainforest and animals in their habitats: ocean, arctic, desert, rainforest, including micro-habitats children to explain where each plant is best suited and why. • Identify and describe different habitats (as above) and how they provide for the basic needs for different animals and plants and how they depend on each other (e.g. ocean creatures need gills to breath underwater – link to year 1's knowledge of animal classification). Include explanation of why each animal/ plant is best suited to their habitat. • Identify and name different sources of food using the idea of a simple food chain as well as describe how they obtained their food 1. Describe how animals obtain their food from other animals, using the idea of a simple food chain(berries – mouse – owl; grass, cow, human; leaves, antelope, lion). Use the knowledge of the arrow meaning 'is eaten by', • Explore and compare the differences between things that are living and dead and have never been alive. 1. Using pictures of animals, fossils, inanimate objects, get the children to classify the differences. **Scientist:** Chris Packham (wildlife conservationist and photographer, some of his autumn/spring watch clips about 'breaking the chain' explain the importance of food chains).	**woodland etc., names of micro-habitats e.g. under logs, in bushes etc.**
3A	I can make systematic and careful observations (light with torches, rocks, magnets, plants) I can take accurate measurements, where appropriate, using standard units (length of shadow experiment, I can use a range of equipment, including thermometers and data loggers (torches, rules, I can record my findings using: • simple scientific language (which is the best rock, fossil formation, all topics) • drawings, labelled diagrams (light – shape of shadow, types of soil, plants) • keys, (animal skeletons, parts of a plant, • bar charts (length of shadow, plant growth, water transportation) • tables (length of shadow, best rock, magnetic materials) I can report on findings from enquiries, including:	**Rocks** • Group together and compare different types of rocks based upon their appearance and physical properties. 1. What is a rock? Compare and group YYtogether different types of rocks (sandstone, marble, limestone, slate, granite) based on their appearance and physical simple properties: texture, appearance, size and weight. 2. Which is best suited to make steps down into the coal mine? Comparative experiment, record in a table and conclusions based on scientific observations (focus on hardness, durable and permeable). Which would be the best rock for….. allow the children to fill in the question and answer based on their knowledge. 3. Conduct a rock hunt around the local area (St Aiden's church) to find out how rocks change over time – look at weathering (sandstone vs marble). Not an experiment over time, but looking at the effects of. • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. 1. Watch BBC learning clips and recount the process of fossil formation. Make fossil using playdough, layers and water – observation over time. • Recognise that soil is made from rocks and organic matter. 2. Classifying experiment: using a bottle of water and soil, shake, and watch to see the separation. 3. Create a labelled diagram in instruction to show what soil is made from. 4. Look at different types of soil (chalky, clay, sandy, peat), show a labelled diagram and predict which would be best to grow a plant in (link to YR/1/2 plants). Conduct experiment over time and draw conclusion. **Scientist:** Geologists (link to palaeontologist – study earth history and fossils) Mary Anning (fossils). Leonardo da Vinci (also a scientist who discovered how sedimentary rocks and fossils are formed). Soil scientist (why this type of job is important – farming, growth, agriculture etc.) **Light**	**Rocks** **Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water: permeable, impermeable, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil, igneous, sedimentary, metamorphic,** **Light** **Light, light source, dark, absence of light,** transparent, translucent, opaque, shiny, **matt,** surface, **shadow,** reflect, **mirror, sunlight,** dangerous,

	• oral explanation (light, all topics) • written explanations (light, rocks, forces, magnets, animals, skeletons, • displays or presentations of results (fossil formation, plants and water) • conclusions (light, best rock, best soil, magnet poles, plants) I can ask relevant questions and use different types of scientific enquiry to answer them: • Can the shadow change shape? • Which rock is best suited to make steps down into the coal mine? • Which is the best rock for…..? • Which soil is best for plant growth? • How many different ways can you make the paper clip move? • Which material is best to support with 'Bowling'? • What would it be like if we didn't have a skeleton? • Would a skeleton made from a different material be better? • How do muscles work? I can set up simple practical enquiries: • Comparative (best rock, plant requirements) • fair tests (best material – forces) • observations over time (fossil creation, plants) • research (skeletons) • pattern seeking (length of shadow, magnet poles swing, healthy meals, plants)	• Recognise that we need light to see in order to see things and that darkness is the absence of light. 1. Using experiment with torches and making the classroom as dark as possible. Use boxes with options to increase the light to try and guess objects inside. • Notice that light is reflected from surfaces. 1. Watch BBC clip showing the different between glow in the dark and reflective surfaces (note reflective material was first invented in the 1940s to increase visibility on roads). 2. Again, use the boxes with brighter coloured objects and some reflective options to prove this theory. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. 1. Link to Y2 knowledge of everyday materials and discuss which material would be best to use to make sunglasses – write conclusion. • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. 1. Use torch and objects to block the light and comment on what is happening. Use the scientific conclusion writing. • Find patterns in the way that the size of shadows change. 1. Can I make a shadow change shape? Using torches change the height of the light source to change the length of the shadow, commenting on the shadow still retaining the shape of the object from previous lesson learning.	
3B		**Forces and Magnets** • I 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 1. Recap knowledge from YR about magnets. Identify some magnetic materials (variety of metals, objects from around the classroom). Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet. Record on a table or Venn diagram. 2. Create a magnet swing and discuss the possibilities of two poles. Link to a compass always pointing north – model that their magnets do in their swings, Describe that magnets have 2 poles. • Describe that magnets have 2 poles. 1. Children to test their magnets to see what happens when they put their bar magnets together. Observe how magnets attract or repel each other and attract some materials and not others. Draw a conclusion. • Predict if 2 magnets will attract or repel by looking at the poles and explain why. **Scientist: William Gilbert (1600, found the earth had a magnetic field – two poles ad compass link).** • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. 1. Show a picture of a person on a skateboard being pulled by a dog. Get the children to describe what is moving and how it is moving. Look at the cause and effect of each element. 2. How many different ways can you move the paper clip? What forces could you use? Encourage the children to investigate 'pushing, pulling, blowing it as well as magnets and then write a conclusion of the differences: the former needed and element of contact but magnets did not. • Compare how things move on different surfaces.	**Forces and Magnets** **Force, push, pull, twist, contact force, non-contact force, friction, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole**

	• organising and classifying (soil, type of magnetic materials, skeletons) • problem solving	1. Describe the materials (link to Y2) and then predict which would be easier for an object to move on. Which would be best for designing an aid in 'Bowling'? Children to design a fair test – looking at one variable (the material). **Scientist:** John Boyd Dunlop (second person to invest the tyre. Link to his fair testing of friction to create a surface to have friction – we want a surface that doesn't).	
3C	I can gather, record, classify and present data in a variety of ways to help in answering questions (see above) I can use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions I can identify differences, similarities or changes related to simple scientific ideas and processes (magnetic poles I can use straightforward scientific evidence to answer questions or to support their findings (light, magnetic poles, skeletons, balanced meal	**Animals Including Humans** • Identify that humans and some other animals have skeletons and muscles for support, protection and movement. 1. Give the children three animals to explain the odd one out (link to Y1/2): mouse, snail and worm. Prompt for diet, habitats, off spring, food chain position. 2. Set up an archaeological dig (link to history and previous rocks topic) to hunt for bones and identify them on a human model. Discuss their purpose. 3. What would it be like if we didn't have a skeleton? Would a skeleton made from a different material be better? How do muscles work? Children to ask these questions in groups and to show their answers in a variety of ways: oral explanation, model, research. 4. Organise and classify the bones in different ways. Encourage the children to think about the position in the body, their purpose and their size. 5. Repeat activity but with skeletons of other animals. Children to organise them for another way to guess the classification keys. Identify two and discuss the similarities and differences using the correct language of their bones. Introduce the idea of an endo- and exo-skeleton to organise again. 6. Children to create model of their hand using art straws as bones, string and ligaments and card to hold it together. Can they describe how muscles and bones work together to help us move. **Scientist:** Osteologist (person who studies the structure of bones) • Identify that animals including humans need the right types and amount of nutrition. • Identify that animals, including humans, cannot make their own food, they get nutrition from what they eat. 1. Link to Y2 and describe a balanced meal using correct terminology (carbohydrates etc.) Look at three meals (lunch box from Y1, pizza from Y2 and a McDonalds), which is the odd one out? Explain why. 2. Look at some food packaging to link their learning from Y2. 3. Use the McDonalds website to create the meal they would usually have and see the nutritional value, see if they can spot the main food groups. Then use it to create a healthy meal. Explain the differences between them. **Scientist:** Nutritionist (talk through that it is the job they are doing rather than a specific person – link to Y1). **Plants** • Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. 1. Recap prior learning by labelling a plant, but ensure that their purpose is explained. Go on a hunt around the local area to collect parts of plants. Back at school, allow the children to classify what they have found using their own keys. • Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow – link to Y2) and how they vary from plant to plant. 1. Set up an experiment over time with variables for each type of plant. • Investigate the way in which water is transported within plants.	**Animals Including Humans** **Nutrition, nutrients,** carbohydrates, **protein,** dairy, vegetables, **sugars, protein, vitamins, minerals, fibre,** fat, water, **Skeleton, exoskeleton, endoskeleton, vertebrate, invertebrate, bones, muscles, support, protect, skull, collar bone, rib cage, spine, radius, ulna, pelvis, femur, knee cap, tibia, fibular, humerous, muscles, joints, exoskeleton, endoskeleton, protective shell, no protection** **Plants** **Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal – wind dispersal, animal dispersal, water dispersal**

		1. Using either white carnations or celery set up the experiment over time to show how water is transported. Children to measure and plot on a table – extend to line graphs ready for next year if ready or with a bar chart with gaps. 2. Look at different leaves and discuss how these have a role in the production of food. • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. 1. Observe two types of root formation (tap root and fibrous root) and notice the difference. Ensure that the key knowledge of roots 'absorb' not 'suck' is used. 2. Collect different seed types (blower, banger, animal disperser, and clinger) and explain how these seeds would travel to create new plants. (BBC learning clip- seed dispersal) 3. Children to order the life cycle of a plant. 4. Using plants in the local area go and look for signs of pollination (use BBC learning clips to show a bee with pollen on his legs). Oral explanations needed. **Scientist:** Tomas Carlo (assistant professor as Penn State University is conducting new experiments into seed dispersal – looking at global climate change, migration and how types of seed disperse in different types of soils).	
4A	I can make systematic and careful observations I can take accurate measurements, where appropriate, using standard units I can use a range of equipment: thermometers data loggers I can record my findings using: • simple scientific language, • drawings, • labelled diagrams, • keys, • bar charts and tables I can report on findings from enquiries: • oral and written explanations, • displays or presentations of results • conclusions I can ask relevant questions and use different types of scientific enquiry to answer them • I can set up simple practical enquiries: comparative and fair tests • Observation over time	**Sound** • Identify how sounds are made, associating some of them with something vibrating. 1. With various items that make noise (drum, tuning fork, cymbal, triangle, bottle), investigate how to make a sound from it. Focus on what they can see when the sound is produced, what they can hear and what they can feel. Link it to feeling the vibrations. • Recognise that vibrations from sounds travel through something to the ear. 1. Using a concept cartoon to introduce many different thoughts about how sound travels, gauge current understanding. 2. Drama activity to mimic sound waves. 3. Children to design an experiment to muffle the sound of a drill. Comparative experiment to with different variables (amount of layers, types of layers). Use data loggers to measure and record. • Recognise that sounds get fainter at the distance from the sound source increases. 1. Link to personal experiences and children to come up with their own hypothesis. Children to design own experiment to test it out and used data loggers to record. Write a scientific conclusion. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. 1. Use a concept cartoon to introduce theories and discuss using own experiences. 2. Using rice on a drum, get the children to test out the theories from the concept cartoon and write up their observations. • Find patterns between the pitch of a sound and features of what produced it. 1. Using a guitar/violin, look at the thickness of the strings and notice the pattern between the pitch and sound. Is this the same for other things that make sound? Pattern observing experiment. Share. Children should be able to draw the different sound waves (pitch, dynamics – link to music). **Scientist:** Robert Boyle was the first scientist to discover that sound waves needed to travel through a medium (air). Galileo Galilei was the first to discover the link between pitch and the features of the instrument. **Electricity** • Identify common electrical appliances.	**Sound** **sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation** **Electricity** **Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, debug**

	• Pattern seeking • Organising and classifying • Problem solving I can gather, record, classify and present data in a variety of ways to help in answering questions I can use results to: • draw simple conclusions, • make predictions for new values, • suggest improvements and raise further questions I can identify differences, similarities or changes related to simple scientific ideas and processes I can use straightforward scientific evidence to answer questions or to support their findings	1. Children to have pictures of various items and ask the children to sort them in different ways (have lights, need batteries, need main sockets, need to be charged or children to come up with their own titles). • Construct a simple electrical circuit, identifying its parts including cells, wires, bulbs, switches. 1. Give the children the correct equipment and ask them to make the bulb light (pre-learning task). Then give the children constraint, if needed – the wires need to connect the components etc. 2. Ask the children to draw their circuit. Talk about the need for things to be labelled as a diagram rather than a drawing in art. 3. Give the children the same equipment (not the bulb) with a buzzer. Ask them to make the buzzer work. Look at similarities and difference between the two circuits. 4. Draw the buzzer circuit. • 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. 1. Show the children drawings of circuits and allow them to explain their reasons. 2. Move onto using real circuits and look at how to 'debug' (check all components, check filament, loose connections, complete circuit etc). Write observations. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. 1. Give the children the same equipment out but this time with a switch. Children to identify patterns in the circuit working and how the switch is positioned. • Recognise some simple conductors and insulators. 1. Give the children the equipment for a circuit and a basket of objects. Predict which will allow electricity to flow through and which wouldn't (identify patterns). 2. Conduct fair test – how would we make it fair? What could we use to make our own switch for an Olympic torch? Children to use knowledge of conductors, how to create a circuit and the purpose of switches to design and build an Olympic torch. **Scientist:** Alessandro Volta (1800 – discovered electricity by mixing chemicals and made the first battery). Talk about the types of scientists as he is an inventor. Warren de la Rue – first found that a filament would create light, but it was economical or long lasting. Thomas Edison – use a thinner, more economical filament and produce the first commercial light bulb	
4B		**States of Matter** • Compare and group materials together, according to whether they are solids, liquids or gases 1. What would the world be like without solids? Gauge children's current understanding of the meaning of solids through writing. 2. Show the children a mixture of raisins and lemonade and discuss what's happening, then record observations. Then give the children the three states of matter and see if they can apply them to the mixture, redraft their observation (short observation over time). 3. Discuss their current understanding of the states of matter – knowledge grid of all three. 4. Give the children cards with the properties of the states of matter and get the children to group them (3 circle Venn diagram). Discuss what makes things a solid etc. using particle diagrams. 5. Which 'state' is rice? Investigate it based upon the properties. Understand that some solids are made up of parts and each part is a solid, which makes it able to pour.	States of Matter **Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, heat, temperature, water cycle, precipitation**

6. Give the children objects to explore and classify (3 circle Venn diagram): toothpaste, sand, air freshener, talcum powder, rice, milk, water, ice, steam (picture), pencil, oxygen (picture or 'cup of'). Introduce the idea of things being more than one state.

- Observe that some materials change state when they are heated, cooled and measure or research the temperature at which it happens.
    1. Give the children some foam burst shower gel and a cup. Children to investigate it and decide which state it is and why. Observe over time and see if it changes. Can objects be more than one state? Why?
    2. Would chocolate be an appropriate material to make chairs out of? (Link to Y2) Children to use current knowledge of changing states and properties to discuss positive and negatives for chocolate as a material for chairs.
    3. Give the children two chocolate buttons (normal and giant). Which would melt first? Children to predict based on prior knowledge and key vocabulary.
    4. Design and experiment to test this out. Discuss fair testing and variables. Children to design and carry out their own experiment.
    5. How many states of matter can water be? Discuss previous knowledge of heating, introduce cooling and freezing. Show a cup of water, boil it to see steam and bring out an ice cube.
    6. Can all liquids be changed into the other two states? Look at water, salty water, honey, golden syrup, olive oil, hand soap and washing up liquid. Predict what will happen to them if they are heated/cooled. Conduct experiment and discuss findings, draw conclusion.
    7. Homework opportunity: research the point and which different materials melt or freeze – show learning in poster/video form for display.

Scientist: Greeks were the first to find the states of matter, but they called them the four elements (earth - solid, water- liquid, air - gas and fire).

- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
    1. Predict what you think will happen to this handprint of a paper towel by the time we get back from lunch. After lunch, ask the children what has happened to find out prior knowledge of evaporation.
    2. Show the children a sock that hasn't dried properly and has become smelly. How could we help the adult to make sure all the washing dries quickly to stop the musty, damp smell? Give small groups socks to design an experiment for the best conditions to dry a sock, conduct experiment. Conclusion: introduce the concept of evaporation (link to temperature and changes in states – previous science topic).
    3. Show the children a picture with a mug, steam, and a steamed up window. Discuss what they can see (link to changes state). Adult to model with a kettle that evaporation and boiling is the same change but at different temperatures. Then use a mirror near the spout to show condensation is the same as cooling but at a different temperature.
    4. Use hot water in a cup, covered with cling film with an ice cube on top. Children to record their findings using the previous lesson's key vocabulary (condensation, evaporation, liquid, gas).
    5. Use all knowledge from this section to explore and explain the water cycle. Use 3D model to show the water cycle. Children research elements of the water cycle and use the water cycle song to learn to parts. Create their own song to describe the water cycle.

Scientist: NASA – Aqua. The satellite is orbiting the Earth collecting data about the water cycle and helps us with our understanding of global warming and climate change. It has found that there in an increase in water vapour which is contributing to the climate change on our planet.

4C		**Animals Including Humans** • Identify the different types of teeth in humans and their simple functions. 1. Children to bite a piece of fruit and talk about which teeth they used and count them. Then give the children vocabulary for the teeth, they have another bite and then describe again what is happening. 2. Label a diagram of the teeth (annotate with their purpose) 3. Write a recount using the correct vocabulary (could be diary entry from the apple.). 4. What would it be like without teeth? 5. (added knowledge due to demographic) How do we look after our teeth? Talk about the purpose of brushing teeth. With permission children to bring in their toothbrushes and tooth paste. Use dental tablets that stain the plaque and show the children how to clean their teeth effectively – the time and the technique. 6. How does food effect our teeth? Use an egg as the shell can represent the enamel on our teeth and children to design a comparative experiment to test out the effect of food on our teeth if we do not brush/if we do brush, could look at different types of toothpaste and evaluate for effectiveness. Link to Y3 looking at the sugar contents of some drinks). • Describe the simple functions of the basic parts of the digestive system in humans. 1. Where does the piece of apple go after being chewed? Use a zoom in/zoom out of the intestines and ask the children to identify what it is. 2. Give the children the names of the parts of the digestive system and the children to research the purpose of each of them. 3. Next lesson, give the children the names again and see if they can order them and explain their purposes. Use a diagram and label the parts of the digestive system. 4. Use the names of the parts of the digestive system and then names of equipment, can the children guess how they are going to recreate it (plastic bag, Weetabix, orange juice experiment). Talk about the time difference between the experiment and real life. 5. Children to link back to their knowledge of the teeth and write a second diary entry for the piece of fruit, and what happens after it leaves the mouth. • Construct and interpret a variety of food chains, identifying producers, predators and prey (recap from Y2). 1. Using a food chain that they used in year 2, allow the children to have a go at remaking it. Recap the knowledge of what the arrow is for, and why it is in a certain order. 2. Give the children word cards (producer etc.) and see if they can apply these to their current food chain. Provide the children with more pictures and animals (zoo, farm, woodland) and some arrows and see how many food chains they can make, correctly labelling the producer, prey and predator. **Living Things and Their Habitats** • Recognise that living things can be grouped in a variety of ways. 1. Show the children three animals, and ask them to find the odd one out (more than one possibility). Check prior knowledge from Y1 and Y2 (carnivore etc. habitats, how they grow). Then show all prior knowledge and see if they can have another go, repeat with another three animals. 2. Use a Venn diagram to group the animals (using prior knowledge as the titles) 3. Introduce a Carroll diagram and group them again. Keep a record of all the ways they have grouped them, introduce grouping them based on a questions – this links to the classification keys. • Explore and use classification keys to help, group, identify and name a variety of living things in their local and wider environment	**Animals Including Humans** **Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars,** herbivore, carnivore, omnivore, **producer, predator, prey, food chain** **Living things and their Habitats** Classification, **classification keys,** environment, habitat, **human impact,** positive, negative, **migrate, hibernate, pollution**

		1. Visit the pond area, visit the Cannock Chase and another area for wildlife. While there, discuss the living things that live there and discuss the reasons for that. 2. Start by playing 'guess who' with different types of animals they found, which then is the premise behind classification keys. Once back in class, use classification keys to create a classification diagram (at least 3 levels, with statements or questions, for at least 5 animals) about the animals they found in different habitats. 3. Challenge the pupils by providing a classification key diagram half completed, with either the animals at the bottom or part of the keys filled in, for the children to figure out the missing elements. 4. Go back to the previous COMPASS statement and now repeat for different types of living things in classification diagrams (Venn, Carroll, classification key); e.g. leaves, trees, flowers, butterflies etc. • Recognise that environments can change and this can sometimes pose dangers to living things 1. Watch BBC learning clips about pollution and the damage to environments e.g. rubbish, cutting down too many trees and not replacing them. Children to research one element that they feel most passionately about: cause, impact and possible solution. Verbally present to the class (use ICT PowerPoint, posters, clips etc.) 2. Write a letter to the parents/ Mrs Sindrey about how they propose we support our wildlife in our community and the changes they would like to implement. Whole school change.	
5A	I can take measurements, using a range of scientific equipment with increasing accuracy and precision, taking repeat readings where appropriate. (Newton meter) I can record data and results of increasing complexity using: • scientific diagrams and labels, (raisins and lemonade, changing state, life cycles, plants, • classification keys, Carroll, Venn • tables (newton metre, • bar and line graphs (multilayer line graph thermal experiment, gestation periods) I can report and present findings in oral and written forms such as displays and other presentations (Shadows experiment, changing states, life cycles) I can plan different types of scientific enquiry to answer questions including recognising and controlling variable where necessary (shadows, air resistance, water resistance, filtering)	**Earth and Space** • Talk about Earth's rotation to explain day and night and the apparent movement of the Sun across the sky. 1. Children to use a torch and ball, to represent the sun and Earth, and create a model to explain how day and night is formed. 2. How do shadows change throughout the day based upon the position of the sun? Children to design their own experiment over a day and write a conclusion to show their findings. • Describe the movement of the Earth and other planets in our solar system relative to the Sun. 1. Prior learning activity, give children vocabulary, what level of understanding do children currently have? Link back to Y1 knowledge of the four seasons, observing weather associated with the seasons and how day length varies. 2. Present children with videos that demonstrate the movement of the Earth and moon, and then presented with the concept cartoon (9.1, 9.11 etc.). Which are true/false? Can they explain how somebody came to that misconception? 3. Out onto the playground, create a moving model of the solar system, children to describe their findings using scientific language. 4. Toilet roll activity, exploring the distance between the planets. • Describe how the moon moves in relation to the earth 1. Give children 3 images of the Earth, Sun and Moon and think about how they are all the same and how they are different. 'Odd one out' 2. Concept cartoon 9.4. Back outside to make the solar system again, this time adding in the moon. All children to move accordingly. What do they notice about the movement of the moon? Concept cartoon 9.10. • Describe the Sun, Earth and Moon as approximately spherical 1. Linking this concept to maths. This explanation should be used in the odd one out activity above when looking at pictures of the planets. Scientist: Ptolemy and Copernicus. Look at the heliocentric and geocentric models of the solar system and why they thought their respective theories.	**Earth and Space** **Earth, Sun, Moon, Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune** **Spherical, Solar system, rotates, star, orbits, planets, axis** **Forces**

	I can use straightforward scientific evidence to answer questions or to support their findings (forces, life cycles) I can identify scientific evidence that has been used to support or refute ideas or arguments (Ptolemy and Copernicus) I can identify differences, similarities or changes related to simple scientific ideas and processes I can use test results to make predictions to set up further comparative and fair tests (changing state, filtering) I can report and present findings, including conclusions, casual relationships and explanations of results (life cycles)	**Forces** Initial hook ideas: 1. Balloon rocket (balloon, straw and string.) How does the balloon move across the string? Encourage the children to use the word 'force in their explanation and investigate whether the amount of air changes their findings. 2. Provide the key vocabulary and a prompt to their year 3 learning and get the children to 'show'; their knowledge of these words (drama or picture form). • Identify the effects of air resistance, water resistance and friction that act between moving surfaces. (Recap of year 3 statement: compare how things move on different surfaces.) Friction: 1. Recap learning of friction from year 3. How could we measure the force more accurately? Force meter: Newton meter. Give the children the opportunity to look at what they do and how to measure the 'force'. 2. Using a variety of objects, measure the force needed to move these objects across a surface. Talk about variables (the surface) and the constant (object). Table. Write conclusion with explanation as to why some measures were higher than others based upon the surface. 3. Introduce friction in our everyday lives. Show the children a video of a child and a slide and talk about how there isn't a lot of friction due to the smooth surface, trainers have the bumpy surface to create friction – why? Etc. Write explanation text. Air resistance: Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. 1. Children to run across the playground once with an open umbrella and once without. Can they explain the difference? (Link to y4 particle knowledge.) 2. Show video of parachutes. Predict what would happen if you change the size of the parachute, linking to knowledge of air resistance. Parachutes investigation: look at size of parachutes, in relation to the size of the object you want to save. Children to create a hypothesis to test out. Explanation to include air resistance and knowledge on gravity. Scientist: Leonardo Da Vinci did drawings of the first parachute, but Sebastien Lenorman **demonstrated it first in 1783** Water resistance: 1. Roll a ball on the ground and then through a tray of water. Children to explain what they see (use prior knowledge on air resistance and friction). Then explain concept of water resistance (link to Y4 particles). 2. Design a boat out of paper that would be tested for different purposes (movement through the water as well as hold the most weight). Test and conclusion. Scientist: Isaac Newton – discovered gravity and the newton meter. • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have greater effect.	Force: push, push, magnetic, **friction, air resistance, water resistance, gravity Earth**
5B		**Properties and Changes of Materials** Hook activity idea: 1. Give the children raisins and lemonade and allow them to predict what they think will happen. Can prompt with the key vocabulary (solid, liquid, gas, separate) when labelling their findings. • Compare and group together everyday materials on the basis on their properties, including their properties, including their hardness solubility, transparency, conductivity (electrical and thermal) and response to magnet (using Y1,2,3 and 4 knowledge).	**Properties and Changes of Materials** solid, liquid, gas, **thermal/electrical insulator/conductor**, magnetic, evaporation, condensation, change of state, mixture, **dissolve, solution, soluble, solvent, insoluble, filter, sieve reversible/non-reversible change,** burning, freezing, melting, rusting, new material

1. Children are given a variety of objects and asked to classify them. The children are to choose their classification diagram (e.g. Carroll, Venn – 3 parts etc.) as well as their headings (properties, ability to change state etc.). Prompts to be given where needed.
2. Provide the children with copies of the key words. Children to classify them, define them and investigate them to ensure retention from previous years.

- Demonstrate that dissolving, mixing and changes of state are reversible changes:
- Recognise that some materials will dissolve in liquid to form a solution, and describe how to recover a substance form a solution

Dissolving

1. Add sugar to water and comment on what happens (dissolved). It is now a solution. Explanation and labelled diagram.
2. How could you speed up the dissolve process? Children set up their own fair test experiment changing a variable (type of sugar or temperature). Hypothesis writing and creating own table to show results.

Filtering (I can use knowledge of solids, liquids, and gases to decide how mixtures might be separated through filtering, sieving and evaporating)

3. Give the children a mixture of water and sand, how could they make change reversible? Show the children filter paper and allow them to investigate. Then give them their sugar solution, can this be filtered?
4. Link to topic (explorers). How do explorers use this process when drinking water in the wild? Investigate the layers needed to make a natural filtration system (moss, stones, soil, rocks in a bottle etc.). Children to label their method and justify their layers order. Test it out and see which order of layers was the most successful.

Scientist: Bear Grylls (explorer) use his video of how to filter water to survive in the wild. Not all scientists wear white coats and work in a Laboratory.

Evaporation

5. Show video of the heating process to separate the water and sugar. Make sure the children understand that this is an irreversible change unless other precautions are used (condensation etc.).
6. Set up the experiment over time using a salt solution. Prediction writing.

Sieving

7. Show the children a mixture of various sizes solids (e.g. pasta, rocks, flecks of metal, salt, sand, chickpeas etc.) and explain there was an accident in the science cupboard and all of this fell of the shelf and has gotten mixed up but Miss Haynes needs it separating. Will filtering or evaporating help? (Old Y6 SATs question). Children to explain why these change in state process wouldn't work.
8. Children to create and write a clear method using all of their prior knowledge (Y1, 2, 3, 4, 5) to separate all of these materials. Children to carry out their method and test whether it would work.

Thermal insulation

9. Miss___ is fed up of her tea going cold too quickly in her thermal mug and is looking for some help. Which would be the best material to keep her tea warm? Best thermal insulator. Children to come up with some materials they could test (use prior knowledge Y4) and set up an experiment using thermometers and record results in multi-layer line graph about temperature over time.

- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials including metals, wood and plastic

1. Make observations: children to be taken on a school tour of the school building, identifying different materials used for different purposes and why they are

		appropriate (using their properties knowledge and any changing state process knowledge from this unit). 2. Select a range of materials, and they were purposeful, i.e. for a bike. Steel for the frame, rubber for the wheels (link to Y3). • Explain that some changes result in the formation one materials, and that this kind of change is not usually reversible. *This knowledge will be communicated through the experiments as children will have misconceptions or ideas that won't work.* • Using a classification diagram at the end of the topic to separate materials given to the children – assessment tool.	
5C		**Living things and their habitats** • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird 1. Look at key vocabulary, what can they remember (Y2), and what do they know? Describe the life process of reproduction in **mammals**. 2. Introduce the live caterpillars (repeat of Y2) to the classroom and encourage the children to ask questions about their life cycle/teach each other what they already know. Explain that this is going to be an experiment over time and that you are going to report its progress in video form as a nature documentary. Alongside the 'presenting' the children could produce diagrams and research elements to share in their 'episodes' about metamorphosis. **3.** Visit Wolsey nature reserve to go pond dipping. Observe the dragon flies and identity the life cycle in various wildlife there. When returned to school, children to research one animal in particular and to create a research pack for Wolsey about it: life cycle, stages of reproduction etc. 4. Compare life cycle between a frog and a beetle, create venn diagram. e.g. The female lays hundreds of egg on a leaf then turns into a larva then the pupa stage and lasts up to 9 month in winter period larva eat a tremendous amount of food to grow and turn into young and then turns into a beetle adult. Research the different stages of the life cycle of a **bird**. 1. Children to research the life cycle of a bird and identify the main stages: egg, hatching, fledgling, adult bird, reproduce. Can they describe similarities and differences between bird and mammal life cycles? Add another 'episode' to their documentary. 2. Compare life cycle of a partridge bird and a robin. What are the similarities and differences, create a venn diagram. E.g.. difference in nesting habitats, egg shape, egg amount, incubation period. Compare the life cycle of a mammal to a bird 1. Provide the children with gestation period graph and identify similarities and difference between the size of the adult and the gestation periods. Look for patterns in life cycle data. Find patterns, can you also find an anomaly? What further questions can you raise based on the data? 2. Create your own question and research data to produce graph. E.g. in the life span of mammals. Scientist: David Attenborough (watch his programmes on life cycles that are age appropriate). Look at his importance to the protection of species due to his knowledge of habitats and their breeding needs. • Describe the life process of reproduction in some **plants** 1. Children to plant a variety of plants in the school grounds (you may want to do this a few weeks in advance to give them time to grow): strawberries, conifers, flowing plants,	

		ornamental grasses, fruit bushes and potatoes. Children to watch these over time and discuss the changes that they are having as well as how they are reproducing. 2. Dissect a daffodil and label it's parts (see key vocab) with the purpose. Discuss pollination and why the bees and insect are important. 3. Go back outside and look at all the different plants in the grounds and see whether they can spot the reproduction system in all plants. This will lead to the idea of sexual and asexual plants. 4. Look at how strawberries are asexual and take cuttings from the plants in the grounds for the children to grow and then take home. Children to write their findings. 5. Look at how potatoes have tubers and compare and contrast the reproduction of strawberry, potatoes and flowering plants. **Animals Including Humans** • Describe the changes as humans develop to old age. **Forces** Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	
6A	I can observe over time, take measurements, using a range of scientific equipment with increasing accuracy and precision, taking repeat readings where appropriate (micro-organisms, exercise) I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables and bar and line graphs (classification diagrams, exercise) I can report and present findings in oral and written forms such as displays and other presentations (circulatory system) I can plan different types of scientific enquiry to answer my own questions including recognising and controlling variable where necessary (micro-organisms, circulatory system, exercise) I can report and present findings in oral and written forms such as displays and other presentations. (circulatory system, light, electricity) I can identify scientific evidence that has been used to support of refute	**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 micro-organisms, **plants and animals**. • Give reasons for classifying plants and animals based on specific characteristics 1. Revisit Y4 knowledge, what do you remember? Revisit Textease from Y4 (use of ICT to create a classification grid). What is classification? What types are there (the children should talk about it grouping items based upon criteria (Carroll, Venn - parts, keys). 2. Plants: give children a leaf, ask children to describe the features to a partner. Identify similarities and differences. How could you classify and group these with other leaves with similar features? Encourage the children to use different classification diagrams and explain their reasoning. 3. Practise: give children a range of pasta. Physically classify these objects, what closed questions could we ask to create a classification key diagram with multiple layers. 4. Revisit terminology (reptile, birds, mammal, amphibian, fish etc.) define distinguishing features. 5. Look at Carl Linnaeus and his work on the classification diagram. Children to role play with their own group of animals to create a classification diagram (try to get a variety of animals for each child so they are all different). Once completed explain their scientific thought process to the others in the class and discuss whether there were other ways of approaching this with the same or different results. Micro Organism experiment 1. Where do micro-organisms grow? What are they? Have a look around school/outside of decay. Conduct an experiment over time, in which location and which type of bread goes the mouldiest the quickest (link to current affairs to provide purpose for the need for bread to remain fresh e.g. somebody is running a marathon, going on a school trip etc. Write conclusion. Scientist: Carl Linnaeus (created classification as a way of ordering the chaos that is nature and being able to make sense of it. He also create the binominal system where each specie and plant is given a genus name followed by a specific species name, all in Latin. He is most famous for coining the term: homo sapiens.	**Living Things and Their Habitats** Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering and non-flowering Use all previous years' vocabulary within the classification keys. **Animals Including Humans** Heart, **aorta, right atrium, right ventricle, left ventricle, left atrium** pulse, **rate, pumps, blood, blood vessels, plasma, veins, arteries, oxygenated, deoxygenated, transported, lungs,** oxygen, carbon dioxide, nutrients, water, muscles, cycle, **circulatory system,** diet, exercise, drugs and lifestyle

	ideas or arguments (Carl Linnaeus, Darwin) I can describe and evaluate my own and other peoples' scientific ideas using evidence from a range of sources (Carl Linnaeus, light bulbs, evolution) I can identify differences, similarities or changes related to simple scientific ideas and processes (electricity, evolution) I can use test results to make predictions to set up further comparative and fair tests (exercise, electricity) I can report and present findings, including conclusions, casual relationships and explanations of results (micro-organisms, exercise, circulatory system) I can use appropriate scientific language to explain and evaluate my methods and findings (micro-organisms, exercise)	**Animals Including Humans** • Identify the main parts of the human circulatory system and describe their functions. • Describe the ways in which nutrients and water are transported within animals, including humans (transported in the blood to the muscles and other parts of the body where ever they are needed) 1. Provide the children with a copy of a blank body and allow them to name parts that they are familiar with, and the parts that are to do with the circulatory system (pre learning). 2. Have a large chalk body out on the playground with the blue and red clearly marked for the children to see the movement of the 'blood'. They are to be the blood cells in the circulatory system – drama activity to understand how it works. 3. Children to record their findings in either a 'documentary style video' that could be used for the following year group, or in a blog style written for their class dojo to inform parents. (Don't post yet, link it to the exercise section later on). 4. Identify the main parts of the circulatory system: • Heart label the parts and identify it's role and how oxygenated and deoxygenated blood travels through the heart • Lungs (ensure that the children are aware that it is the deoxygenated blood that is pumped here and the reason. • Blood (plasma, white blood cells, red blood cells and the purpose of each feature) • Pulse/heart rate • Veins and arteries • How oxygenated and deoxygenated blood travels around the body ` Create a job advert for each of these parts, record some for the documentary video. 5. Create 'blood' and look at the parts within it (see above) and each of their roles. Scientist: Helen Brooke Taussig. A deaf and dyslexic pioneer of correcting heart defects in children. Her research and operation was the forerunner to adult open heart surgery. • Recognise the impact of diet, exercise, drugs and lifestyle on our bodies. 1. **Exercise** - Conduct PE experiment and record using excel spreadsheets and present findings in a graph. For example, "Which exercise raises my heart rate the most? How long does it take my heart rate to recover from exercise? Do my heart rate differ according to the amount of exercise I do? Use heart monitors, stop watches etc. Children to design their own table to record the results as well as which graph would be better to show the results (bar, line, scatter) and then to explain their reasoning. **Diet, drugs and lifestyle**, (covered again in Summer term of the society curriculum to revist and aid retention) look at the effect of drugs and alcohol on the heart and lungs, sort healthy and unhealthy organs, plan a healthy and unhealthy meal considering all aspects of a balanced diet. Link with literacy and society, research healthy lifestyles, produce a non- chronological report with findings. i.e. (smoking and nicotine, alcohol, lifestyle, sleep, mental health, diet, exercise). Using this knowledge as well as the knowledge from the circulatory system, children are to start a 'change4life' campaign with the parents and children on Y6 – could be other year groups to. Children to create video explaining the science and the reasons behind healthy eating, healthy swaps, heart rate for activity. Can come up with a competition/challenge. Assessment tool.	
6B		**Light** Use a concept cartoon to recap prior knowledge of light from Year 3, (that darkness is the absence of light, light is reflected from surfaces and shadows are formed)	**Light** **Straight lines, Light rays, travel,** light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect,

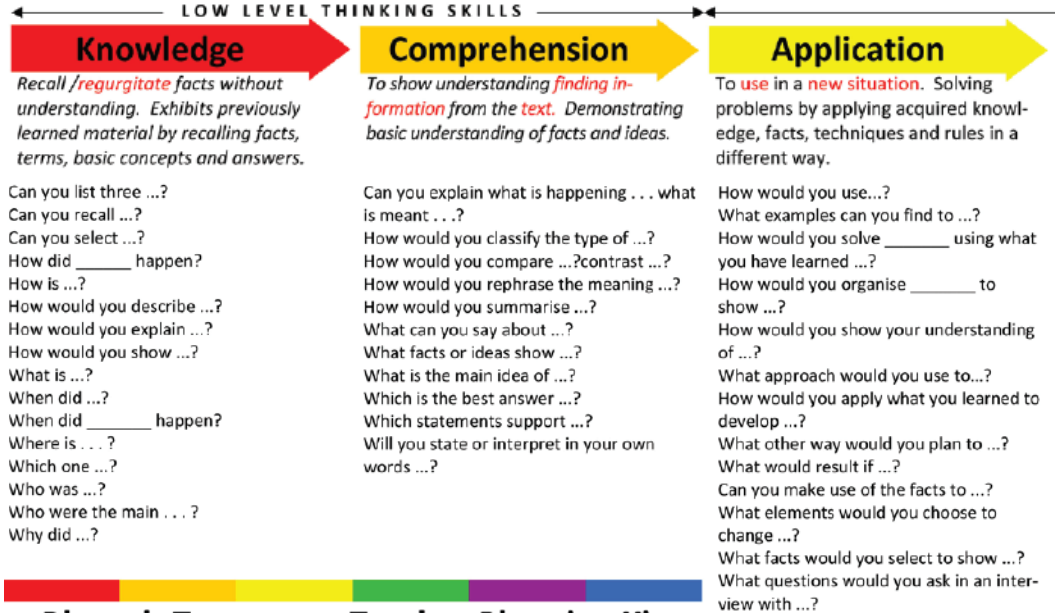
		• Recognise that light appears to travel in straight lines 1. Conduct an experiment to show that light travels in straight lines, giving the question "How does light travel?" Give the children a variety of different materials, (hose pipe, tubes, opaque cardboard, coloured plastic) and torch. Generate their own hypothesis, plan and conduct and experiment to prove or disprove their theory. 2. What happens when the hose pipe is bent? What happens when you a mirror is introduced? What do you notice? Has this changed your view of how light is travelled? Record and analyse findings • 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 of the way light travels from light sources to our eyes or from light sources to objects and then to our eyes. 1. Draw and label image of the eye (see vocab) briefly outline their purpose. 2. Draw and label the process of how light travels from the sun/source, bounces off the object and into our eyes. 3. Conduct experiment of reflecting the light, how using reflective objects or mirrors enable us to see objects that are not right in front of us (this could be proven through making a periscope, linking to WW2 knowledge). 4. Investigate the idea of refraction (Light travels and bounces off surfaces into our eyes. When light travels from air through water, glass or anything that lets light through, it gets bent. This bending is called refraction.) • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. 1. Generate own statement to prove through their investigation, i.e. the closer the object is to the light, the larger the shadow (link to year 3 knowledge repeated version of experiment but developing thinking) "*Investigate how the shadow size can be changed depending on the direction of the light*" . Children to use their knowledge of light travelling in straight lines, to explain how shadows can be changed. 2. Maths Link and record data on a line graph. Measure: a, How far was the object form the wall. B, How far away from the light. C, Length of shadow. D, Width of shadow 3. Draw and label the process, linking explanations back to light travelling in straight lines. Scientist: C.V Raman. First looked into 'light scattering' when it passes through objects.	mirror, sunlight, dangerous, **refraction,** eye lids, cornea, iris, sclera, pupil, anterior chamber, ciliary muscle, optic nerve, lens, retina
6C		**Electricity** Recap Y4 electrical knowledge by giving children a bag of electrical equipment and ask them to make a working circuit. Challenge: can you make a circuit using only 1 wire, 1 cell and 1 bulb? • Use recognised symbols when representing a simple circuit in a diagram 1. Using their circuits they previously made, give the children the symbols for the components and they are to draw them accurately. Use symbols for: bulb, wire, cell; make sure the batter/cell is at the top, and the wires are straight and draw in a square sort of shape.) 2. Create a working circuit with motor, switch, and buzzer and draw using recognised symbols. 3. Give opportunity for children to debug broken or incorrect circuits, both practically and by looking at the symbols in a diagram. • Associate the outcome of a circuit with a number and voltage of the cells used • Compare and give reasons for variations in how components function, including the brightness of bulbs, loudness of buzzers and the on/off positions of switches 1. Use concept cartoon to introduce the hypothesis of how to make the bulb brighter. Children to analyse what is being said and what they believe. Teach 'voltage'. Give children the option for how they want the test their hypothesis e.g. 1 cell, keep adding	**Electricity** Circuit, complete circuit, circuit diagram, **circuit symbol: cell, battery, bulb, buzzer, motor, switch, voltage** (Children do not need to understand what voltage is but will use volts and voltage to describe different batteries.)

		lots of components, what do you notice? Or 1 component, and keep adding lots of cells increasing the voltage. 2. Could they relate their previous lesson knowledge to making a buzzer louder or moving the switch? Repeat experiment using their prior findings to influence their decisions. 3. Children to generate their own hypothesis they want to test linking to electrical circuits (experiment over time). How long will it take a cell to run out with only 1 bulb? Will the motor slow down when the cell is running low? Scientist: Thomas Edison (Y4) and Humphrey Davy. Look at Humphrey's findings of using electrical currents to produce light and the issue of keeping the light and how Edison created filament which then allowed the previous science by Humphrey to continue: there were many people trying to produce the first light bulb. **Evolution and Inheritance** Ask the children to create a mind map about the key vocabulary of evolution, inheritance and adaptation. This is to identify their current knowledge (2,3,4). • Identify how animals and plants are adapted to suit their environment in different ways and that adaption may lead to evolution 1. Provide a picture of a cactus with the key features annotated (thick skin, large, fleshy stems, spikes, shallow roots) and they are to explain how that has adapted to its environment (climate, water etc.) 2. Children are to choose an animal (polar bear, owl, penguin, zebra, starfish, camel, and giraffe) and to research it based upon its adaptability for its environment (link to habitat, climate, food, water etc.). BBC learning clips. 3. Challenge the children to think about the consequences of that animal not adapting to its species as well as others (Y2, 4 life cycles). 4. Look at the peppered moth and how humans have had an impact on its adaptability (industrial revolution) and how through evolution the offspring can vary to their parents. 5. Children to be given an environment (possibly linked to their literacy work) and they are to create an animal that is suited well to it and explain. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents 6. Look into Darwin and the Galapagos Island. Give the children different types of tweezers to represent the beaks and different containers to get food from. Investigate which 'bird' would survive and what adaptations would need to be made through evolution in order for the other species to survive. Write detailed conclusion (using Darwin's reports as a guide). 7. Use baby pictures of staff/children (where appropriate) with the pictures of their parents and see if the children can match up the child to the correct parents based upon features. Children to explain their justifications and explain that it is not always identical offspring. 8. Use Making Reebops: a model for meiosis (practicalbiology.org) to create reebops to investigate how sometime we take characteristics and sometimes we don't. • Recognise that living things have changed over time and that fossils provide information about things that lived on the Earth millions of years ago 1. Show the children a picture of a woolly mammoth and an elephant. Find similarities and differences. Can they explain why each are suited for their environment and the adaptions that have taken place. 2. Look at the evolution of a horse (hyracotherium, mesohippus, merychippus, pilohippus, equus) using pictures of fossils. Children to explain the process of evolution using the evidence.	**Evolution and Inheritance** **Offspring, sexual reproduction, vary, characteristics, suited, adapted**, environment, **inherited**, species, fossils, habitat, **consequences, evolution, inheritance, adaptation**

		3. Can they use the same theories to explain the evolution of man? Scientist: David Attenborough– new findings on how animals Scientist: Charles Darwin – theory of evolution, findings from Galapagos Island and the finches.	

Progression examples in…

Asking questions : We use Bloom's Taxonomy to create our scientific questions based on the level of understanding of a substantive topic.



Making predictions

Year 1	Children should be able to verbalise what they think will happen using things they have seen before and lesson learning in a simple sentence form adding a reason where possible. E.g. I think that _____ will happen because _____
Year 2	Children will be able to write using the language of predict using prior knowledge and lesson learning in a complex sentence. E.g. I predict that _____ will happen because I know _____
Year 3	Children will be able to write using the language of predict using prior knowledge and lesson learning in a complex sentence. Children will start to add other things that could happen. E.g. I predict that _____ will happen because I know _____. I also think that _____ could happen because _____.
Year 4 **Year 5**	Children will be able to use the term 'hypothesis' correctly and to explain their reasons behind their own predictions using scientific fact, prior learning and links to other possibilities. E.g. Hypothesis. I believe that _____ will happen, due to the fact that _____. As I know _____, this means that _____
Year 6	Children should be able to make predictions about a multiple of things that are going to happen as well as things that won't happen, regardless of the type of experiment, using prior knowledge in disciplinary and substantive knowledge as well as knowledge from daily life. Encourage the children to think of different elements within their experiment as they will be looking at multiple variable experiments.

Setting up experiments

Year 1	Children know that an experiment is where we test out our predictions. Children know that we have to use the same equipment to keep things 'fair'.
Year 2	Children know about 'fair testing' and can choose a 'variable'. When setting up experiments, the children are able to use clear instruction based writing to show the sections of an experiment (prediction, equipment, method, and conclusion).
Year 3	Children are able to select a variable and explain their reasons for this. They can organise an experiment around the variable and gather the equipment they need. When writing up an experiment, the children are able to clearly explain their steps using the correct vocabulary all of the time.
Year 4	Children can create their own experiments without support and know that variables are needed. They are starting to understand that they can test out a theory with more than one variable with support and will make scientific choices for this. They are starting to choose the enquiry type based on the hypothesis and type of scientific knowledge they are looking at.
Year 5	Children are able to set up multiple types of experiments with the necessary equipment to meet the needs of their experiment and can make informed choices to the variables, location, and enquiry type. They are able to understand and explain the reason for their enquiry type chosen and can compare and contrast against other enquiry types.
Year 6	

Observing and measuring

	Observing	**Measuring *(link to Maths Mastery unit)***
Year 1	What do you see? Comment on what is changing over time. Diagrams, using equipment to measure, note taking	Using equipment to measure their experiments with support from adults. Using known units of measurements (e.g. cm, m, ml)
Year 2		
Year 3	Using scientific vocabulary to explain what they are seeing. Observe different outcomes and take about the differences in comparative observations. Use equipment for observations (microscopes, magnifying glasses etc.)	Use topical units of measure and using equipment that has different whole intervals. Starting to use equipment/intervals for a reason.
Year 4		
Year 5	Multiple variables. Is there another way to get the same outcome? Multiple experiment to observe and can use diagrams, explanations and a variety of ways to show their knowledge.	Increased difficult in scales (e.g. less marked intervals, decimals etc.) Choosing the equipment for a reason and can explain their reasons. Can discuss which would not be appropriate and why (can show why).
Year 6		

Recording data: Graphs *(this links to the Maths Mastery module of graphs for each year group. The science lessons will be reinforcing their knowledge of the type of graph, and using them in a real life context, rather than teaching a new type of graph).*

Reception	Pictograms and Venn diagrams with separate circles (not over lapping).
Year 1	Block graphs and Venn diagrams with separate circles (not over lapping).
Year 2	Pictograms, block graphs and tally charts.
Year 3	Charts and tables, over lapping two Venn diagram, great than/less than/ equals symbols, start using bar charts.
Year 4	As above and coordinates, bar charts, time lines, tables.

Year 5	As above and line graphs, time tables
Year 6	As above pie charts and multi-line graphs.

Interpreting and communication results: Conclusions

Year 1	Conclusions to include basic observations of what happened. Answer the question: what did we find out?
Year 2	Conclusions to include the above and whether they were right. Linking their conclusion to their prediction.
Year 3	Conclusions to include as above. Begin to include, 'what did I find out and why did this happen?' Do this through modelling, class discussions and guided work.
Year 4	Conclusions to include as above with more independence and start to disregard explanations and justify why one explanation is better/more accurate/more detailed/more scientific than another. In their conclusions, talk about how they could do the experiment better, Include concept cartoons and who do they agree with? Start to include what they could do next based on what they now know?
Year 5	Conclusions to include as above independently, with key vocabulary used correctly and further explanation about the reasons they did 'something' within their experiment: We did this because _____. Because we did this, this happened.
Year 6	Conclusion to include all of the above with greater depth and links to other scientific concepts or knowledge. Think about, 'are these results accurate' linking to their knowledge of 'mean' and their hypothesis. Evaluations to include how successful the experiment was and any improvements to the carrying out of the experiment linking to variable, constants etc.

Classifying and organising.

Year 1	Children should sort objects into two clear groups with constraints.
Year 2	Children should be using a two circle Venn diagram with support where necessary.
Year 3	Children should be able to create a Venn diagram themselves and creating the headings independently. Children should use databases (computer generated) to organise objects.
Year 4	Children should be using three circle Venn diagrams with support and beginning to use Carroll diagrams with support where necessary. Children start to use keys for a branching database.
Year 5	Children should be using three circle Venn diagram independently as well as a Carroll diagram and start making the choice themselves as to which they use. Children should be using a branching database to organise using scientific questions with key vocabulary.
Year 6	Children are confident in using multiple circle Venn diagrams, Carroll diagrams and branching databases and understand the purpose behind both. They can confidently choose the most appropriate method for the task.