Year Four

During Year 4 children develop the skills of working scientifically through 3 units:

Year	Questioning & Enquiry	Observing and Measuring	Investigating	Recording & Reporting Findings	Identifying & classifying	Conclusions	Key Vocab
4	Raise their own questions about the world around us and make some decisions about which types of enquiry will be the best ways of answering these	Take systematic and accurate measurements using standard units and a range of equipment (thermometers, data loggers) Help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used.	Set up simple practical enquiries, comparative and fair tests Decide which variables to keep the same and which to change	Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables.	Decide criteria/use keys for grouping, sorting and classifying including by behaviour or properties based on testing	Start to use scientific evidence to answer questions and support findings beginning to look for patterns, similarities and differences in the data	**Gather/record data** **Present** **Key** **Bar chart** **Table** **Prediction** **Evidence** **Interpret** **Conclusion**
Connections to Mathematics Units (Year 4)				Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs (using a greater range of scales)			

Unit 1 (Autumn Term): Sound

Connections to other science units: This is the first unit the children encounter				
Unit	**Curriculum objectives**	**Assessment**	**Key vocabulary**	**Ideas**
Sound (Physics) **Year Four**	**Identify how sounds are made** >identify how sounds are made, associating some of them with something vibrating **Structure of the ear and how sound travels** >recognise that vibrations from sounds travel through a medium to the ear **Pitch and volume of sound** > find patterns between the pitch of a sound and features of the object that produced it >find patterns between the volume of a	**I can use the vocabulary linked to sound.** **I can explain how sounds are made** **I can label the parts of the ear** **I can find patterns in sounds that are made by different objects** **I can explain how objects get fainter the further away they are**	**Sound** **Sound source** **Vibrate/Vibration** **Insulator/Insulate** **Volume** **Pitch** **Outer ear** **Middle ear** **Inner ear** **Ear canal** **Ear drum** **Cochlea** **Auditory nerve***	Pupils should explore and identify the way sound is made through vibration in a range of different musical instruments from around the world; and find out how the pitch and volume of sounds can be changed in a variety of ways. **Pupils might 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. They might make earmuffs from a variety of different materials to investigate which provides the best insulation against sound. They could make and play their own instruments by using what they have found out about pitch and volume. **Examples of activities:** >Children investigate how effective 5 different materials are at blocking sound. Recognising the difficulty at actually measuring the loudness of a sound, they make each measurement 3 times and take the median. Children use their results to create a bar chart and place the materials in order of effectiveness as sound insulators. >Children learn the difference between pitch and volume. They carry out an investigation where they place 5 different water containers in order, depending on the pitch made when air is gently blown across the top of each one. They attempt to find a pattern and explain their results. >Children explore how a string instrument makes sound. Using an ice cream tub, elastic bands and Lego blocks, they create a string instrument. They explore how adding more Lego blocks affects the pitch of each string (band). >Children learn that pitch and volume are two different properties of sound. They investigate the pitch and volume of the sound made when 5 different balls are dropped. Recognising the difficulty of measuring pitch and sound without equipment, children make 5 measurements and then choose the modal value. Children transfer the results to a scatter graph showing both pitch and volume. >Working on the school playground, children investigate the height a ball needs to be dropped from in order to be heard at different distances. Children predict and then measure the minimum height required, recording their results in a table. They create a line graph and

	sound and the strength of the vibrations that produced it > recognise that sounds get fainter as the distance from the sound source increases.			explore the link between the distance and the minimum height (and therefore volume) required. **Links to websites for additional activities:** https://www.hamilton-trust.org.uk/science/year-4-science/sound-listen/?gclid=EAIaIQobChMI5I7KzuCZ6QIVU4BQBh00MwpAEAAYASAAEgIU2vD_BwE https://www.stem.org.uk/resources/community/collection/12746/year-4-sound
Significant individuals	Robert Boyle (1627-1691)-A British scientist who determined that in order for sound to travel/transfer, it has to go through a medium. This medium would be air. Alexander Graham Bell (1847-1922)-Inventor of the first practical telephone			
Common misconceptions:				Pitch and volume are frequently confused, as both can be described as high or low. Some children may think: Sound is only heard by the listener Sound only travels in one direction from the source. Sound can't travel through solids and liquids high sounds are loud and low sounds are quiet.
Science Rich Texts:	**Books which allow opportunity to explore science:** •Mrs Armitage on Wheels by Quentin Blake •Oscar and the Bat by Geoff Waring •Peace at Last by Jill Murphy •Horrid Henry Rocks (see www.stem.org.uk/teaching-science-through-stories) •Moonbird by Joyce Dunbar •The Pied Piper of Hamelin by Natalia Vasquez			

***Bold text is new vocabulary**

Unit 2 (Spring Term): Plants

Connections to other science units: This is the third time the children have encountered plants **(Years 1 & 2)** This will build towards their learning for **Year 5 (living things and their habitats)**				
Unit	**Curriculum objectives**	**Assessment**	**Key vocabulary**	**Ideas**
Plants (Biology) **Year Four**	**Water transportation** **Functions of parts of plants** >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 **Life cycle (pollination, seed**	**I know and can use key vocabulary to talk about plants** **I can label different parts of plants** **I can explain the different functions of parts of a plant** **I know what plants need to grow, and how this can be different for different plants** **I can explain how water is transported in plants** **I can describe the lifecycle of plants and use diagrams to explain this**	Light Dark Food Water Bulb Growth/Grow Germination Stage Survival **Temperature** **Leaf** **Root** **Nutrient/nutrition** **Soil** **Air** **fertiliser** **Life cycle** **Pollination** **Seed formation** **Seed dispersal** **Reproduction***	Pupils should be introduced to the relationship between structure and function: the idea that every part has a job to do. They should explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition and flowers for reproduction. **Note:** Pupils can be introduced to the idea that plants can make their own food, but at this stage they do not need to understand how this happens. **Pupils might work scientifically by**: Comparing the effect of different factors on plant growth, for example, the amount of light, the 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. They might 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. **Examples of activities:** > Observe what happens to plants over time when the leaves or roots are removed. > Observe the effect of putting cut white carnations or celery in coloured water. >Investigate what happens to plants when they are put in different conditions e.g. in darkness, in the cold, deprived of air, different types of soil, different fertilisers, varying amount of space. > Spot flowers, seeds, berries and fruits outside throughout the year. > Observe flowers carefully to identify the pollen. > Observe flowers being visited by pollinators e.g. bees and butterflies in the summer. > Observe seeds being blown from the trees e.g. sycamore seeds. > Research different types of seed dispersal.

	formation, seed dispersal) >explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.			> Classify seeds in a range of ways, including by how they are dispersed. > Create a new species of flowering plant. >Children grow 1, 4, 9 and 16 onion sets in 4 different pots. They make observational drawings and measure the height of the plants over 4 weeks. They use their measurements to complete a line graph showing the growth of all plants (this activity could be started before Science Week). >Children look at images of food plants. They identify the different parts, including roots, tuber, stem, bulb, trunk, branch, leaf, flower, and fruit. They discuss which part of the plant we normally eat. >Children label a diagram of a flowering plant. They explain the function of the flower, stem, leaves and roots. Children can cut and paste descriptions or write their own. >Children predict and measure how long it takes for coloured liquid takes to rise up the stem of a carnation flower and colour its petals. They make a drawing of the flower at the start and end of the investigation and predict what would happen if the flower had a shorter stem. >Children read about the 4 stages in the life cycle of a flowering plant - germination, growth, flowering, and fertilisation/seed production. They create a life cycle diagram, cutting and pasting descriptions and pictures or writing and drawing their own. >Children learn how pollination is vital to flowering plant reproduction. They read about insect pollination and create their own process description by either cutting and pasting descriptions or writing in their own words. Children learn about different seed dispersal methods evolved by plants including dispersal by gravity, by wind, by water, and by animals. They examine 6 different images of fruits and seeds and try to explain how they might be dispersed.
Significant individuals	George Washington Carver – American scientist and teacher who is famous for many agricultural discoveries and inventions.			
Common misconceptions:				Some children may think: • plants eat food • food comes from the soil via the roots • flowers are merely decorative rather than a vital part of the life cycle in reproduction • plants only need sunlight to keep them warm • roots suck in water which is then sucked up the stem.

Science Rich Texts:	**Books which allow opportunity to explore science:** • What's inside a Flower by Rachel Ignotofsky • The Extraordinary Gardener by Sam Boughton • From Tiny Seeds: The Amazing Story of How Plants Travel by Émilie Vast • The Story of Frog Belly Rat Bone by Timothy Basil Ering • The Hidden Forest by Jeannie Baker • George and Flora's Secret Garden by Jo Elworthy • Oh Say You Can Seed! by Bonnie Worth • A Tree is a Plant by Clyde Bonnie Bulla • The Magic of the Mystery of Trees by Jen Green and Claire McElfatrick • A Seed is Sleepy by Dianna Aston • Grow: a first guide to plants and how to grow them by Rizanino Reyes and Sara Boccacini Meadows • The Wonder of Trees by Nicola Davies and Lorna Scobie

***Bold text is new vocabulary**

Unit 3 (Summer Term): States of Matter

Connections to other science units:

This is the second time children have encountered materials **(Year 1 every day materials)**

This will build towards their learning for **Year 5 (Properties and changes in materials)**

Unit	Curriculum objectives	Assessment	Key vocabulary	Ideas
States of matter (Chemistry) Year Four	**Compare and group materials** > compare and group materials together, according to whether they are solids, liquids or gases **Materials change state when heated/cooled and the effect of evaporation/condensation** > 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. **Note:** Teachers should avoid using materials where heating is associated with chemical change, for example, through baking or burning.	**I can use key vocabulary related to states of matter** **I can group materials according to whether they are solid, liquid or gas** **I know (and can name) some materials that can change state** **I can explain how heating/cooling affects different materials** **I can offer a simple explanation of the water cycle using key vocabulary and diagrams**	**Solid** **Liquid** **Gas** **Particles** **Change** **State** **Matter** **Group** **Classify** **Temperature** **Oxygen** **Evaporation** **Condensation** **Water Cycle***	Pupils should explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container). Pupils should observe water as a solid, a liquid and a gas and should note the changes to water when it is heated or cooled. **Pupils might 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). They could research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. They might 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. **Examples of activities:** > Observe closely and classify a range of solids. Observe closely and classify a range of liquids. > Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind. > Classify materials according to whether they are solids, liquids and gases. > Observe a range of materials melting e.g. ice, chocolate, butter. > Investigate how to melt ice more quickly. > Observe the changes when making rocky road cakes or ice-cream. > Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate. > Explore freezing different liquids e.g. tomato ketchup, oil, shampoo. > Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration).

				> Observe water evaporating and condensing e.g. on cups of icy water and hot water. > Set up investigations to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers. > Use secondary sources to find out about the water cycle. >Children investigate the melting point of 3 familiar materials: ice, chocolate and butter. They use a thermometer to measure the temperature and record their results in a table. They discuss how accurate their predictions were and whether melting is a reversible change. >Children investigate how effective different materials are at insulating a cold drink and slowing its increase in temperature. They use thermometers to measure the temperature of each cup every 15 minutes over the course of 2 hours. Children record their information in a table and create a line graph showing the temperature of all 4 cups over a 2-hour period. >Children investigate how rapidly water placed in different locations evaporates overtime. Using a table, they record the capacity of different measuring containers overtime. They complete a line graph showing the change in capacity. They learn how a line graph can be used to infer missing information e.g. evening.
Significant individuals	Bernard Palissy Discovered the water cycle Anders Celsius Invented the thermometer in degrees Celsius			
Common misconceptions:				Some children may think: • 'solid' is another word for hard or opaque. • Solids are hard and cannot break or change shape easily and are often in one piece. • Substances made of very small particles like sugar or sand cannot be solids. • Particles in liquids are further apart than in solids and they take up more space. • When air is pumped into balloons, they become lighter. • Water in different forms – steam, water, ice – are all different substances. • All liquids boil at the same temperature as water (100 degrees) • Melting, as a change of state, is the same as dissolving. • Steam is visible water vapour (only the condensing water droplets can be seen) • clouds are made of water vapour or steam • the substance on windows etc. is condensation rather than water

		• the changing states of water (illustrated by the water cycle) are irreversible • evaporating or boiling water makes it vanish evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material. Apply knowledge in familiar related contexts
Science Rich Texts:	**Books which allow opportunity to explore science:** •Once Upon a Raindrop: The Story of Water by James Carter •The Rhythm of the Rain by G Baker-Smith •The storm whale in winter by Benji Davies •Charlie and the Chocolate Factory (see www.stem.org.uk/teaching-science-through-stories) •Sticks by Diane Alber •States of Matter poem by Michael Rosen	

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