Year Five

During Year 5 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
5	Take systematic and accurate measurements with increasing accuracy using a range of different units (mass, time, weight, area) Identify what data needs to be collected and choose the most appropriate equipment to use	Start to use test results to make predictions and set up further comparative and fair tests Identify independent and dependent variables in an investigation	Begin to record data and results of increasing complexity using scientific diagrams and labels, classification keys and graphs.	Begin to record data and results of increasing complexity using scientific diagrams and labels, classification keys and graphs.	Learn to develop keys and other information records to identify, classify and describe living things and materials	Begin to draw conclusions based on their data, observations and scientific evidence, using their findings to make predictions and to set up further comparative tests	**Plan** **Variable** **Accuracy** **Precise** **Repeat readings** **Scientific diagram** **Classification key** **Scatter graph** **Line graph**
Connections to Mathematics Units (Year 5)				Solve comparison, sum and difference problems using information presented in a line graph Complete, read and interpret information in tables Select an appropriate way of presenting data graphically			

				explaining the reasons for my choice			

Unit 1 (Autumn Term): Properties and Changes of Materials

Connections to other science units: This is the third unit children encounter which is in **Year 1 (everyday materials)** and **Year 4 (states of matter).**				
Unit	**Curriculum objectives**	**Assessment**	**Key vocabulary**	**Ideas**
Properties and changes of materials (Chemistry) **Year Five**	**Compare/group together materials based upon their properties** > compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets **Changing properties of a material (solid-liquid); Reversible changes of state of matter** >know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution >use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through	**I can use the vocabulary linked to properties and changes of materials** **I can identify the properties of a range of materials** **I can use the terms reversible and irreversible changes and relate them to solids, liquids and gases** **I can describe reversible and irreversible changes using diagrams** **I understand that materials are made out of particles, and I can describe their movement in**	Solid Liquid Gas Particles Change State Matter Group Classify Temperature Oxygen Evaporation Condensation **Property** **Hardness** **Solubility** **Transparency** **Electrical Conductivity** **Thermal Conductivity** **Magnetic** **Non-magnetic** **Reversible** **Irreversible**	Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4. They should explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes. Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda. **Note:** Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. Safety guidelines should be followed when burning materials. **Pupils might work scientifically by:** Carrying out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?' They might compare materials in order to make a switch in a circuit. They could observe and compare the changes that take place, for example, when burning different materials or baking bread or cakes. They might research and discuss how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials. **Examples of activities:** >Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat. > Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate.

	filtering, sieving and evaporating >demonstrate that dissolving, mixing and changes of state are reversible changes >explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. >give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic	**different states of matter** **I can describe some separation techniques of materials**	**Soluble** **Insoluble** **Solution** **Mixture** **Substance** **Filter** **Sieve** **Evaporate** **Melt** **Dissolve** **Transparent** **Translucent** **Opaque** **Comparative test** **Fair test***	> Investigate rates of dissolving by carrying out comparative and fair test. > Can create a chart or table grouping/comparing everyday materials by different properties > Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture. > Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning. > Carry out comparative and fair tests involving non-reversible changes e.g. What affects the rate of rusting? What affects the amount of gas produced? > Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton). >Children investigate the properties of different materials. They predict and then investigate whether the materials are electrical conductors, transparent, strong thermal conductors or magnetic. They record their results in a table, and then complete a Venn diagram containing two intersecting sets, choosing 2 properties by which to group the materials. >Children learn that when a solute dissolves in a solvent to create a solution, its particles spread out so that they can no longer be retrieved by filtering. They investigate whether sand, sugar, salt, flour or iron filings will dissolve in water. They record their results in a table and then display the results in a single-set Venn diagram. They consider how they could separate the mixtures and solutions. >Children learn about the 6 methods of separating solutions – picking out by hand, decanting, sieving, filtering, magnetism, and evaporation. They consider 6 different mixtures/solutions and discuss the best way to separate them. They attempt to separate them using their chosen methods. They discuss whether their method worked and why. >Children learn about the origins of post-it notes, wrinkle-free cotton, polar fleece or Gore-Tex. They write an information text, showing when and whom they were invented, their advantages/disadvantages and their application. >Children investigate different physical changes in materials. They identify whether they can be easily reversed or are in fact irreversible and explain how and why.
Significant individuals	Stephanie Kwolek – a famous chemist. She's best known for inventing Kevlar in 1965. Kevlar is a strong plastic that was first used to replace steel. Marie Curie – famous for discovering radium and polonium. She carried out the first research into the treatment of tumours with radiation.			
Common misconceptions				Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes

	result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed. Some children may think: • thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change.
Science Rich Texts:	**Books which allow opportunity to explore science:** •Kensukes Kingdom (see www.stem.org.uk/teaching-science-through-stories) •What a Waste by Jess French •George's Marvellous medicine (see www.roalddahl.com)

***Bold text is new vocabulary**

Unit 2 (Spring Term): Living Things and their Habitats

Connections to other science units: This is the third unit children encounter which is in **Year 2 (Living things and their habitats) and Year 4 (Plants)**				
Unit	**Curriculum objectives**	**Assessment**	**Key vocabulary**	**Ideas**
Living things and their habitats (Biology) Year Five	**Life Cycles** >describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird **Life Processes** >describe the life process of reproduction in animals and plants. **Classification** >describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals >give reasons for classifying plants and animals based on specific characteristics.	**I can use appropriate scientific vocabulary to identify, name and classify different animals** **I can describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals.** **I can describe life cycles of different animals** **I can explain the different stages of reproduction in a range of animals** **I can make comparisons between the stages of growth of**	**(revisit Y1 vocab animal types)** Nutrient/nutrition Soil Air fertiliser Life cycle Pollination Seed formation Seed dispersal reproduction **Life cycle** **Chrysalis** **Pupae** **Caterpillar** **Larva** **Reproduction** **Characteristic** **Vertebrate** **Invertebrate** **Classification** **Microorganism*** **Examples of activities:** >Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals. > Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth. > Look for patterns between the size of an animal and its expected life span.	Pupils should observe life-cycle changes in a variety of living things, for example, plants in the vegetable garden or flower border, and animals in the local environment. They should find out about the work of naturalists and animal behaviourists, for example, **David Attenborough and Jane Goodall.** Pupils should find out about different types of reproduction in animals. Pupils should be introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. Through direct observations where possible, they should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals). They should discuss reasons why living things are placed in one group and not another. Pupils might find out about the significance of the work of scientists such as **Carl Linnaeus**, a pioneer of classification. **Pupils might work scientifically by:** >observing and comparing the life cycles of animals in their local environment with other animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences. >They might observe changes in an animal over a period of time (for example, by hatching and rearing chicks), comparing how different animals reproduce and grow. >using classification systems and keys to identify some animals and plants in the immediate environment. They could research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system.

		different animals (including humans)		> Grow and observe plants that reproduce asexually e.g. strawberries, spider plants, potatoes. >Take cuttings from a range of plants e.g. African violet, mint. > Plant bulbs and then harvest to see how they multiply. > Use secondary sources to find out about pollination. > Through a 2-player game, children explore different ways of sorting animals according to their life cycles. Using 9 challenge cards containing descriptions such as 'undergo metamorphosis' and 'are eusocial', children sort 10 different animals. They discuss which grouping was most difficult and attempt to create their own challenge cards. > Children learn about the purpose of a flower and its basic structures, including petal, anther, sepal, carpel, stigma, style, ovary, pollen grain, pollen tube and ovule. They label a diagram of a flower and carpel and complete an explanation text showing how flowering plants reproduce. > Children learn that, unlike animals, pieces broken off from plants can grow into another individual organism. They learn that this is used by farmers to create many crops with identical characteristics (such as planting potato tubers). By cutting up a plant such as a potato or tomato plant, children investigate which parts will grow into a new individual. >Children take cuttings from a basil plant to show how plants can grow by asexual reproduction > Children learn that animals reproduce sexually and each individual has a male and a female parent from which they inherit various traits. Children explain the process of animal reproduction, including the stages of sperm and egg production, mating, fertilisation, and the growth of a zygote into an embryo.
Significant individuals	Carolus Linnaeus – a famous biologist. Famous for devising the formal two-part naming system to classify all lifeforms – binominal system. Jane Goodall – behaviouralist scientist. Famous for her research on the chimpanzees of Gombe Stream National Park in Tanzania. David Attenborough – naturalist scientist. Famous for his comprehensive survey of animals and plant life on Earth.			
Common misconceptions:				Some children may think: • All plants start out as seeds • All plants have flowers • Plants that grow from bulbs do not have seeds • Only birds lay eggs.
Science Rich Texts:	**Books which allow opportunity to explore science:** •Beetle boy by M.G. Leonard •Charlotte's Web by EB White •The Land of Neverbelieve by Norman Messenger •Insect Soup by Barry Louis Polisar			

	• Fur and Feathers by Janet Halfman • Spirit of the Jungle by Bear Grylls • Life Cycles: Everything from Start to Finish by DK and Sam Falconer • Hair in Funny Places by Babette Cole • Mummy Laid an Egg by Babette Cole • You're Only Old Once! By Dr Seuss • Giant by Kate Scott • Botanicum (welcome to the Museum) by Kathy Willis and Katie Scott

***Bold text is new vocabulary**

Unit 3 (Summer Term): Earth and Space

Connections to other science units: This is the first time that children encounter this unit.				
Unit	**Curriculum objectives**	**Assessment**	**Key vocabulary**	**Ideas**
Earth and Space (Physics) **Year Five**	**Solar System** >describe the movement of the Earth, and other planets, relative to the Sun in the solar system **Earth & Moon** >describe the movement of the Moon relative to the Earth >describe the Sun, Earth and Moon as approximately spherical bodies **Day & Night** >use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	**I can use key vocabulary to talk about the solar system** **I can name the planets in our solar system** **I know that the sun is a star at the centre of our solar system** **I can use a model/diagram to explain the movement of the planets to the sun/moon to the Earth** **I know how the rotation of the Earth causes day and night to occur** **I understand how ideas have changed through history about how the solar system is constructed**	**Solar System** **Sun** **Moon** **Star** **Orbit** **Rotate/Rotation** **Elliptical** **Day** **Night** **Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune** **Pluto** **dwarf planet***	Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night. Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones). **Note:** Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus. **Pupils might work scientifically by:** Comparing the time of day at different places on the Earth through internet links and direct communication; creating simple models of the solar system; constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day; finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks. **Examples of activities:** > Use secondary sources to help create a model e.g. role play or using balls to show the movement of the Earth around the Sun and the Moon around the Earth. > Use secondary sources to help make a model to show why day and night occur. > Make first-hand observations of how shadows caused by the Sun change through the day. > Make a sundial. > Research time zones.

				> Consider the views of scientists in the past and evidence used to deduce shapes and movements of the Earth, Moon and planets before space travel. >Children learn about 3 different planet classifications - terrestrial, gas giant, and ice giant. They carry out a networking activity where each child has a sheet containing incomplete information and they find out the missing data from their friends. They discuss various ways of comparing, grouping and ordering the planets. >Children learn that ancient astronomers developed the geocentric model because it was the best explanation available at the time. They learn that the heliocentric model superseded it for scientific reasons - because it agrees more closely with observations. Children cut out pictures of the Sun and the eight major planets of the solar system and use them to complete a diagram by placing them in order of distance from the Sun. >Children learn about 3 different planet groups - terrestrial, gas giant, and ice giant. Children look at diagrams of the planets which are in proportion to one another. They use an 'Earth ruler' to measure the diameter of the planets in Earth diameters in order to compare them to the Earth. They then use a ruler marked in cm to measure the diameter, before using a formula to calculate their true size. They record their data in a table and look for patterns. Children can use the planet diagrams to make a display. > Children learn that day and night are caused by the rotation of the Earth, and that the Sun only appears to move across the sky. Using a split pin, children create a moving model showing how the rotation of the Earth causes day and night. They move their model through a day and night cycle, using speech bubbles to explain what they would experience at each stage of the cycle. > Using a template, children cut out and assemble their own sundial. They carefully attach the gnomon (shadow caster). On a sunny, rain and wind-free day, children calibrate their sundial by fixing it in position and marking where the shadow of the gnomon falls at 9am, 10am, 11am, 12pm, 1pm, 2pm and 3pm. Children predict where the 4pm shadow line would fall.
Significant individuals	Stephen Hawking – famous for his work on the origins and structure of the Earth. Brian Cox – famous for his work on the origins and the solar system. Mary Jackson – first black female engineer in America. Katherine Johnson – worked for NASA and calculated flight paths for spacecrafts over 30 years. She was part of the team that calculated where and when to launch the rocket for the Apollo 11 mission.			
Common misconceptions:				Some children may think:

	• the Earth is flat • the Sun is a planet • the Sun rotates around the Earth • the Sun moves across the sky during the day • the Sun rises in the morning and sets in the evening • the Moon appears only at night • night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.
Science Rich Texts:	**Books which allow opportunity to explore science:** • Dr Maggie's Grand Tour of the Solar System by Dr Maggie Aderin-Pocock • How to be an Astronaut and Other Space Jobs by Dr Sheila Kanani • George's Secret Key to the Universe (see www.stem.org.uk/ teaching-science-through-stories) • The Skies Above My Eyes by Charlotte Guillain and Yuval Zommer • The Way Back Home by Oliver Jeffers • Cosmic by Frank Cottrell and Steven Lenton • The Jamie Drake Equation by Christopher Edge • A Galaxy of Her Own: Amazing Stories of Women in Space • Hidden Figures: The True Story of Four Black Women and the Space Race

***Bold text is new vocabulary**