Science Skills and Knowledge Progression

Intent

Our school delivers the National Curriculum objectives through hands on, practical lessons with 'working scientifically' at its core. Our pupils learn about plants, animals, habitats, adaptation, states of matter and forces and much more. We intend for all of our children to be able to use the correct vocabulary for each topic and to remember it long after the topic is over. These words are shared though our KCQVs. We plan for high-level vocabulary that is suitable yet challenging for our children. Children are given many opportunities to carry out practical observations and experiments, developing their curiosity and reasoning. Children will plan, carry out and evaluate experiments and observations throughout their time here and by the end of Year 2 we expect that they are able to do this independently with confidence. Children are exposed to high-quality models throughout Early years and Key stage 1 so they are able to make independent decisions as what, how and why they use resources; they will be able to discuss with their friends their reasoning for doing so. We help to build happy scientists who leave our school ready to take on their next challenge in Year 3 and beyond. Throughout pupils' time at Wantage Primary Academy, we develop pupils' curiosity, enjoyment, skills and a growing understanding of science knowledge, through an approach in which pupils raise questions and investigate the world in which they live.

Implementation

Our Science curriculum follows subject content outlined in the National Curriculum Programme of Study. Science lessons are structured using the progression document to lead planning. lessons are timetabled and taught weekly, allowing children to develop their knowledge and skills effectively whilst also maintaining knowledge from previous learning. At the beginning of each science lesson, previous knowledge and vocabulary is rehearsed through. This is also displayed on learning walls for the children to access at all times. Children record their learning in their science books from Year 1 upwards. Each topic begins with a knowledge web which is built upon in science lessons and reflected upon at the end of the topic. Teachers plan activities and resources with scientific enquiry at its core, enabling children to develop their skills and knowledge simultaneously. Teachers use many forms of formative assessment to monitor understanding and plan next steps for children which are personal to them. Science is taught discretely but will be linked to our Topic work where appropriate e.g. Our topic: Frozen planet linked the ideas of habitats, adaptation and survival.

Coverage Overview	Autumn	Spring	Summer
Reception	Seasonal changes Marvellous Me Animals including humans/ living things Light and Dark Seasonal changes	Seasonal changes Earth and space Teeth Nutrition	Seasonal changes Plants Magnetic and non-magnetic items Animals including humans / living things
Year 1	Everyday materials Seasonal changes	Animals including humans Seasonal changes	Plants Seasonal changes
Year 2	Recap Seasons Uses of materials	Living things and habitats Animals including humans	Plants Working Scientifically
Year 3	Rocks and Soils Lights and shadows	Identifying forces- Magnetism Describing materials Requirements for growth and life cycles	Animals including humans: Nutrition (linked to DT) Skeletons and muscles Plants
Year 4	States of matter Sound	Living things and their habitats	Animals, including humans. Teeth and digestion Electricity
Year 5	Properties and changes of materials Forces	Earth and space	Animals, including humans
Year 6	Electricity Light	Living things & their habitats – animals and humans	Evolution and inheritance Light and Electricity

Colour Coding (to sup differentiation)	Skills/knowledge in **black** text are to be covered with whole class. Skills/knowledge in **purple** text are to challenge and help extend children and apply their skills and knowledge at greater depth (3 star challenge)					
	EYFS	**Year 1** / **Year 2**		**Year 3** / **Year 4**		**Year 5** / **Year 6**
Working Scientifically NC Skills and Knowledge	• To comment and ask questions about aspects of their familiar world, such as the place where they live or the natural world. • To talk about some of the things they have observed, such as plants, animals, natural and found objects. • To talk about why things, happen and how things work. • To look closely at similarities, differences, patterns and change. • To draw conclusions. • To predict and speculate.	• Ask simple questions. • Observe closely, using simple equipment. • Perform simple tests. • Identify and classify • Use observations and ideas to suggest answers to questions. • Gather and record data to help in answering questions.		• Ask relevant questions. • Set up simple practical enquiries, comparative and fair tests. • Make accurate measurements using standard units, using a range of equipment, for example thermometers • Gather, record, classify and present data in a variety of ways to help in answering questions. • Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables. • Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests. • Identify differences, similarities or changes related to simple scientific ideas and processes. • Use straightforward scientific evidence to answer questions or to support findings.		• Plan enquiries, including recognising and controlling variables where necessary. • Use appropriate techniques, apparatus and materials during fieldwork and laboratory work. • Take measurements, using a range of scientific equipment, with increasing accuracy and precision. • Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs and models. • Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships and conclusions. • Present findings in written form, displays and other presentations. • Use test results to make predictions to set up further comparative and fair tests. • Use simple models to describe scientific ideas identifying scientific evidence that has been used to support or refute ideas or arguments.

End Outcomes for Working Scientifically

EYFS

Children follow instructions involving several ideas or actions. They answer 'how' and 'why' questions about their experiences and in response to stories or events.

Years 1 and 2 Pupils will be able to explore the world around them and raise their own questions. They will have experienced different types of scientific enquiries, including practical activities and begin to recognise ways in which they might answer scientific questions. They will be able to use simple features to compare objects, materials and living things and, with help, will be able to decide how to sort and group them, observe changes over time, and, with guidance, they will begin to notice patterns and relationships. They will be able to ask questions and use secondary sources to find answers. They will be able to use simple measurements and equipment to gather data, carry out simple tests, record simple data and talk about what they have found out and how they found it out. With help, they will be able to record and communicate their findings in a range of ways and begin to use simple scientific language.

Years 3 and 4 Pupils will be able to raise their own questions about the world around them. They will have started to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions; recognise when a simple fair test is necessary and help decide how to set it up; talk about criteria for grouping, sorting and classifying; and use simple keys. They will have begun to look for naturally occurring patterns and relationships and decide what data to collect. They will have made decisions, with help, to make decisions about what observations to make, how long to make them for and the type of equipment needed. They will have collected data from their own observations and measurements, using notes, simple tables and standard units and decided how to record and analyse data. With help, pupils will be able to look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions. They will be able to identify new questions arising from data, make predictions for new values within data collected and identify ways to improve what they have already done. They will also be able to recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations. Pupils will be able to use relevant scientific language to discuss their ideas and communicate findings in ways appropriate for different audiences.

Years 5 and 6 Pupils will be able to explore ideas and raise different kinds of questions; select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why. They will be able to use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment. They will be able to make their own decisions about what observations to make, what measurements to use and how long to make them for and whether to repeat them; choose the most appropriate equipment to make measurements and explain how to use it accurately. They will be able to decide how to record data, look for different causal relationships in their data and identify evidence that refutes or supports their ideas. They will be able to use their results to identify when further tests and observations might be needed; recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact. They will be able to use scientific language and illustrations to discuss, communicate and justify their scientific ideas and will be able to talk about how scientific ideas have developed over time.

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		Plants	**Plants**	**Plants**	**Plants**	**Plants**	**Plants**

Living things **NC Skills and Knowledge for Plants** **NC Skills and Knowledge for Animals and Humans** **NC Skills and Knowledge for Living Things** **NC Skills and Knowledge for Evolution and Inheritance.**	**To develop** an understanding of growth, decay and changes over time. **To show** care and concern for living things and the environment. **To eat** a healthy range of foodstuffs and understand a need for variety in food. **To show** some understanding that good practices with regard to exercise, eating, sleeping and hygiene can contribute to good health. **To observe** the effects of physical activity on their bodies. To examine change over time e.g growing plants, worms growing in the wormery.	**Name** some common wild plants and some common garden plants. **Sort** plants into common garden plants and common wild plants. **Compare** plants which are common garden plants and common wild plants. **Name** some common evergreen and deciduous trees. **Sort** trees into evergreen and deciduous. **Identify similarities and differences** between deciduous and evergreen trees. **Name** each part of a flowering plant. **Apply** knowledge to **describe** the structural features of a range of real flowering plants. **Observe and Describe** the growth of seeds and bulbs. **Compare the similarities and differences** in the growth of seeds and bulbs. **Describe, list** what plants need to stay healthy. **Sort** a range of plants according to given criteria. Think of some ways to **categorise** plants and explain choices. **Create** a garden **design** for someone who likes privacy and bright autumn colours.	**Identify** the requirements seeds, beans and bulbs need, in order to grow. **Observe and explain** how seeds, beans and bulbs grow. Compare the similarities and differences between how seeds, beans and bulbs grow. **Devise** a way of **proving** that plants need certain conditions for growth. **Suggest** reasons why a cactus may find it difficult to survive in cold, wet conditions. **Name and match** simple methods of seed dispersal. **Explain** why plants need to disperse seeds and how they are dispersed. **Compare** the effectiveness of seed dispersal through wind and animal.	Use real flowering plants to **locate and name** the parts of a flower. **Compare** different flowers and explain the differences in size and shape of the parts of a flower. **Describe** and **illustrate** the functions of different parts of flowering plants. **Explain** how leaves are important in creating food for a plant. Compare and contrast conditions for growth for a range of different plants **Apply** all knowledge of plants and their requirements, to create a planting plan and **justify** the choice of plants chosen. **Observe and record** the growth of a range of different plants. **Experiment** to see how water is transported through a plant and summarise observations. **Prove or disprove** that roots act like straws sucking up water for the plant. **Explain** why a flower that is not pollinated will not reproduce. **Answer** a range of questions about flowering plants, where they have to **suggest reasons** why something does or does not happen **Describe** process of pollination. **Lis**t ways in which plants are pollinated. **Describe** how seeds are formed.	No new coverage, recap key facts/knowledge from Y3 at the start of 'living things'	No new coverage, recap key facts/knowledge from Y4 at the start of 'living things'	No new coverage, recap key facts/knowledge from Y5 at the start of 'living things'

		Animals and Humans **Name** some common animals. **Match** animals to the labels: bird, fish, amphibian, reptile, mammal and invertebrate. **Explain** the main differences between birds, fish, amphibians, reptiles, mammals and invertebrates. **Prove** that a reptile could not be confused with a mammal – **give evidence.** **Name and label** the structures of common animals. **Complete** tables that compare the structures of common animals. **Create** an ideal environment for minibeasts and **prove** that this is a successful habitat. **Label** the main parts of the human body. **Illustrate** the parts of the body associated with the five senses. **List/Sort** objects in the outside environment according to the sense being used. **Sort** different foods into groups, using different senses.	**Animals and Humans** **Name** the offspring of animals and humans (e.g. babies for humans, puppies for dogs.) **Match** the offspring to the adult. **List** the basic needs of animals, including humans, for survival. **Name** what is needed for a healthy diet and lifestyle. **Observe and describe** the effect of exercise. **List** the ways that humans may resemble their parents. **Explain** the main differences between adult animals and humans and their offspring. Present similarities and differences between parents and their children. **Suggest** some ways that an animal's offspring (including humans) are dependent, for some time, on adults. **List** and **compare** the types of foods that different animals require. **Explain the concept** of a human's need for clean water and why this is not so important for other animals. **Categorise** food types and **explain** why each group is important to humans.	**Animals and Humans** **Name** the 7 different types of nutrition that humans and named animals need. **Describe** a healthy fraction of the main nutrients needed. **Illustrate** how humans and named animals get nutrition from their food. **Name** the natural sources of humans' food- e.g milk from cows, eggs from hens **Summarise** the main differences between carbs, fibres, fats, proteins and water. **Compare and contrast** how humans and flowering plants obtain their food. **Investigate** malnutrition/ lack of nutrition. **Label** the main bones and joints in the human skeleton and of some animals. **Name** the main muscles. **Describe** role of skeleton and muscles. **Observe and describe** the role of muscles in human movement. **Categorise** muscle movement as relaxing or contracting and begin to explain the relationship between muscle groups. **Apply knowledge** to recommend exercises to use each main muscle.	**Animals and Humans** **Draw and label** a food chain. **Name** producers, predators and prey in a food chain. **Describe** producers, predators and prey as herbivores, carnivores or omnivores. **Describe** energy flow in a food chain. Identify patterns in the flow of energy in a food chain. Demonstrate how food chains always begin with sunlight. Explain why water is essential in a food chain. **Answer** questions where thy have to **suggest and explain** reasons given **Label** the parts of the human digestive system and **describe** the functions. **Relate** the human digestive system to the way humans get nutrition and contrast this with how plants get nutrition. **Suggest** reasons for human digestive problems. **Label** the types of adult human teeth. **Describe** the functions of the different types of teeth. **Describe** good care of teeth. **Compare and contrast** human teeth with those of a carnivorous animal and begin to explore. **Cite evidence** of how diet is linked to the health of human teeth.	**Animals and Humans** **Describe** the main changes in the human body from childhood to adulthood to old age. Compare and contrast the physical appearance of children and adults. Begin to graph changes in average heights of males and females at different ages. Summarise your findings. **Interpret** data about normal blood pressure in children and adults and draw some conclusions. Make **generalisations** about the **relationship** between age and changes in humans.	**Animals and Humans** **Name** some nutrients that are important for humans. **Describe** how nutrients are important for animals and humans. **Describe** a heathy, balanced diet and **answer questions** about the importance of diet and exercise. **Observe and record** the effect of exercise on the heartbeat. Describe some of the possible effects of poor exercise, drug misuse (including smoking) and a poor diet on the way the human body functions. **Relate** information about blood pressure to diet and lifestyle. **Draw and label** diagrams of the human circulatory system. **Describe** the functions of the heart, blood vessels and blood. **Draw** diagrams that show how arteries and veins are connected by capillaries. **Describe** how water and nutrients pass from the arteries, through capillaries, to veins. **Contrast** the different roles of veins and arteries in the human circulatory system. **Explain the similarities and differences** between arteries, veins and capillaries. **Explain** why the transportation of water and nutrients in humans is important for: joints, mucus membranes, blood, removing toxins. **Rela**te the transportation of water in humans and animals to your knowledge of plants. **Explain** the different functions of the parts of the human heart. **Graph** the effect of exercise on pulse rate and **explain** the findings. **Explain** the possible effects of too much sugar in the diet on how the human body functions. **Discover** how coronary arteries may become blocked and what this causes
		Living Things No coverage	**Living Things** **Identify** different types of habitats and name the	**Living Things** No new coverage	**Living Things** **Name** groups of animals and plants.	**Living Things** **Draw and describe** the life cycle of	**Living Things** **Describe** the life processes common to all living things.

			animals and plants which live there. **Explain** why different habitats suit the needs of different animals and plants. **Identify and name** a variety of mini beasts that live in a microhabitat. Explain what a microhabitat is and how it is suited to the mini beasts which live there. **Identify and name** different sources of food for animals. **Create and label** simple food chains. **Know** the terms 'predator' and 'prey' and describe the part they play in a food chain. **Label** animals as carnivore, herbivore or omnivore. **Show** how carnivores, herbivores and omnivores are similar and different. **What** does a … like to eat? **(name it)** **Draw** a food chain that ends with a sparrow hawk. Explain the differences in a food chain for a herbivore and a carnivore. **Always, sometimes or never?** Food chains end with a carnivore. **Organise** things of your choice into groups: living, dead and never been alive. **Observe** and list the key features of things that are living, dead and that have never been alive. **Describe** things as living, dead or never been alive. **Give evidence** to show that a … has never been alive. I know this because.		**Match** animals and plants to groups. **Describe** the features of animals and plants in particular groups. **Compare and contrast** the features of animals and plants in different groups. **Summarise** key similarities and differences of animals and plants in different groups. Explain chosen key similarities and differences to summarise. **Suggest, reason, propose, arrange** ways in which animals could be classified into more than one group. **Identify** animals and plants using a classification key. **Complete** classification keys from a list of animals and plants. **Adapt** a classification key to include different criteria. **Construct** classification keys for animals and plants. **Name and describe** a range of habitats. **Identify and label** specific plants and animals in these habitats. **Describe** how a change to an environment is a danger to specific habitats. **Explain the concept** of conservation and how groups are trying to preserve habitats.	- a mammal - an amphibian - an insect - a bird **Explain** the similarities and differences in the life cycles of a mammal, an amphibian, an insect and a bird. **True or False?** All young offspring look like smaller versions of their adult parents. **Always, sometimes, or never?** Eggs are common to the life cycles of mammals, amphibians, insects and birds. **Draw and describe** the process of reproduction in some plants and some animals. **Draw and describe** the process of reproduction in some animals. **Explain** the similarities and differences between the process of reproduction in plants and animals. **Relate** the reproduction of plants to your knowledge of the life cycle of insects. **Relate** the reproduction of some animals and plants to your knowledge of food chains.	Why do the leaves of deciduous trees change colour and fall off in autumn? **(generalise)** How does this **relate** to any life processes of animals? **Identify** plants, mammals, amphibians, insects and birds from classification keys. Explain why observable features are used to classify living things into broad groups. **Make** classification keys. **Propose** criteria for the creation of classification groups for: mammals, amphibians, insects, birds. **Present** information about and reasons for these groups. **Recognise and name** the characteristics used in classification groups for plants and animals. **List** reasons why these characteristics are used. Explain some of the problems with not using specific characteristics when classifying living things. Observable characteristics are not the only way to scientifically group plants and animals. **Do you agree?**
		Evolution and Inheritance No coverage.	**Evolution and Inheritance** No coverage.	**Evolution and Inheritance** No coverage.	**Evolution and Inheritance** No coverage.	**Evolution and Inheritance** No coverage.	**Evolution and Inheritance** **Categorise** fossils in a number of ways.**Compare and contrast** different fossils.

							Explain the process of the formation of fossils. Burning fossil fuels is widely thought to contribute to a rise in worldwide temperature. **Investigate this and cite evidence** that supports or questions this view. **Name** a variety of animal and plant fossils. **Describe** the conditions in which the fossils once lived. **Note, name and describe** plants and animals that inhabited the Earth millions of years ago. **Match** a range of animals and plants to the environments in which they are found. **Describe** how animals and plants are suited to their environment. **Illustrat**e how animals and plants adapt to environments. **Describe** how plants and animals may evolve through adaptation to their environment. **Compare and contrast** the way different plants and animals have adapted to their environments. What is the **relationship** between plants adapting to their environments and the theory of human evolution? **Explain** and give examples of the idea of adaptation. **True or False?** Plants and animals would not survive if they could not adapt. Which do you think are the best examples of an animal and a plant that show adaptation? **(suggest)** Evolution is the only way a species can survive. **Do you agree?** **Match** pictures of offspring to their parents. Human and animals. **Name and describe** how they sometimes resemble each other. **Notice** that and **describe** how this may not be the case for all humans. **Categorise** differences in living things and their offspring. **Explain**, with examples, how offspring are not identical.

							Observe and describe differences between living things and their offspring. **Is it possible** that a litter of cocker spaniel puppies from two parents of the same colour may vary in colour? **Notice** and **label** the resemblance between plants and those that grow from their seeds. Categorise resemblances between humans, plants and animals and organise findings. **Explain the concept** of inheritance. **Investigate** how scientists and doctors are researching conditions that are inherited.

End Outcomes for Living things

EYFS

Children know the importance for good health of physical exercise and a healthy diet, and talk about ways to keep healthy and safe. They manage their own basic hygiene and personal needs successfully, including dressing and going to the toilet independently.

Children know about similarities and differences in relation to places, objects, materials and living things. They talk about their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.

Year 1

Throughout the year, pupils will have used their local environment to explore and answer questions about plants growing in their habitat. Where possible, they will have observed the growth of flowers and vegetables that they have planted. Throughout the year, pupils will have used their local environment, to explore and answer questions about animals in their habitat. They will understand how to take care of animals in their local environment and return them safely. Pupils will have become familiar with the common names of some fish, amphibians, reptiles, birds and mammals. Pupils will have had the opportunity to learn the names of the main human body parts, through games, actions, songs and rhymes. Pupils will have used observations to compare and contrast animals, describing how they identify and group them; grouping animals according to what they eat; and using their senses to compare different textures, sounds and smells.

Year 2

Pupils will have observed how plants grow and know what plants need to germinate, grow and survive and reproduce. Pupils will have observed and recorded the growth of plants as they change from a seed or bulb and will have set up a comparative test to show what plants need to stay healthy. Pupils will be able to name life processes that are common to all living things. They will be familiar with the term 'habitat' and 'microhabitat' and will have observed how living things (plants and animals) depend on each other. Pupils will be able to compare animals in familiar habitats and less familiar habitats, such as: seashore, woodland, ocean and rainforest. They will be able to sort and classify living things and record their findings using charts. They will be able to construct a simple food chain that includes humans, describe conditions in habitats and how the conditions affect the number and type of plants and animals that live there. Through observation and measurement, pupils will be able to identify some basic needs for animals to survive and know the importance of exercise and nutrition for humans. They will have been introduced to reproduction in animals and humans but do not need to understand it yet.

Year 3

Pupils will have looked at the structure and function of plants and know that all parts have a job to do. They will know that roots and stem play a role in nutrition and support, leaves for nutrition and flowers for reproduction. They will have been introduced to the idea that plants can make their own food, but they do not need to understand how this happens. Pupils will have continued to learn about the importance of nutrition and will have been introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions.

Year 4

Pupils will have raised and answered questions, to help them to identify and study plants and animals in their habitat and how these habitats change throughout the year. Pupils will have explored ways of grouping a wide variety of living things and will have grouped invertebrates and vertebrates. Pupils will be able to construct and interpret a variety of food chains, identifying producers, predators and prey. Pupils will have explored positive and negative examples of human impact on environments. Pupils will have been introduced to the main body parts associated with the digestive system and have explored questions that help them to understand their special functions. Pupils will be able to identify different types of teeth in humans and describe their simple functions.

Year 5

Pupils will have observed life-cycle changes in a variety of living things (plants and animals) They will also have had the opportunity to find out about the work of naturalists and animal behaviourists, e.g. David Attenborough and Jane Goodall. Pupils will have found out about sexual and asexual reproduction in plants and sexual reproduction in animals. Pupils will have drawn a timeline to indicate stages in the growth and development of humans. They will also have learnt about the changes experienced in puberty.

Year 6

Pupils will have been introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. They will be able to make direct observations and use these to classify animals into commonly found invertebrates and vertebrates. They will be able to discuss reasons why living things are placed in one group and not another. Pupils will also know about scientists such as Carl Linnaeus, who was a pioneer of classification, and the significance of their work. Pupils will use their prior knowledge about main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function. Pupils will know how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body (PHSE link). Pupils

will have found out more about how living things on earth have changed over time. They will know that characteristics are passed from parents to their offspring. They will also know that variation in offspring over time can make animals more or less able to survive in particular environments. Pupils will also have found out about the palaeontologist Mary Anning and how Charles Darwin and Alfred Wallace developed their ideas on evolution.

Chemistry	**EYFS**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
NC Skills and Knowledge for Materials. **NC Skills and Knowledge for Rocks, Soils and Fossils** **NC Skills for Solids, Liquids and Gases.**	**To begin** to be interested in and describe the texture of things. To examine how changes may be reversed, e.g. melting ice.	**Materials** **Match** an object to its original material. **Name** the object and its original material. **Observe and name** everyday materials. **Arrange** objects made of the same materials and **label** the materials. **Observe and name** the properties of everyday materials. **Complete** tables that describe the properties of materials. **Place** materials into groups under the headings given to you. **Choose own criteria** for sorting materials into groups. **Describe** the different properties of materials. **Observe and describe** changes to the shape of solid objects when they are squashed, bent, twisted or stretched. **List** different uses for everyday materials. **List** and **explain** reasons for the suitability of materials for particular uses. **Rocks, Soils and Fossils.** No coverage. **Solids, Liquids and Gases** No coverage.	**Materials** **Choose** some objects and **explain** how they were made from their original material. **Explain** how a bottle is made from sand. **Group** objects based on the materials they are made from. **Explain your groupings.** **Investigate** which objects started off as a plant. **Explain** why the properties of materials are useful for deciding which materials to use for an object. **Give examples**. **Design** an item of clothing to keep the wearer dry. **Describe** how best to group materials on the basis of their properties. **Explain** reasons for the groups. **Create** a 'guess the material' game based on the properties of materials. **Experiment** with changing the shape of solid objects. Organise and summarise your findings. **Always, sometimes or never?** The shape of wood can be changed through squashing, bending, twisting or stretching. **Compare and contrast** the properties of materials and use this to **explain** why certain materials are used for particular purposes. Paper is unsuitable for a model boat. Agree or disagree? (reason and justify)	**Materials** No new skills to be covered. **Rocks, Soils and Fossils** **Name** different types of rock. **Describe** the properties of different rocks. **Label** minerals found in rocks. **Compare and contrast** the properties of rocks. **Group rocks** based upon properties. **Infer** the names and types of rocks based upon observable properties. **Always, sometimes or never?** Rocks that sparkle have a high quartz content? **Describe** rocks as igneous or sedimentary. **Observe and describe** the properties of igneous and sedimentary rocks. **Illustrate** how igneous and sedimentary rocks are formed. Explain the main differences between igneous and sedimentary rocks. Compare origins of rocks and identify patterns that would help to infer the type of rock. **Generalise:** How can the hardness of a rock be **related** to its origins? **Describe** the formation of fossils. **Illustrate** the formation of fossils. **Is it possible** that fossils could be found within igneous rocks? **Cite evidence.** **Observe and describe** the properties of soils.	**Materials** No new skills to be covered. **Rocks, Soils and Fossils** No new skills to be covered. **Solids, Liquids and Gases** **Name** materials as Solids, Liquids or gases. **Observe and describe** the properties of S, L and G. **Compare and contrast S,L and G** **Classify** liquids in different ways. **Classify** solids in different ways. **Classify** gases in different ways. **Explain** why a helium filled balloon will float in air. **True or False?** Liquids take the form of the container they are in. Solids keep their shape unless they are altered by a force. **Always, sometimes or never?** Gases are lighter than solids. **Observe and describe** the effect of heating and cooling, chocolate, butter and other everyday materials. **Measure** the changing temperature of materials as they are heated and cooled and **complete** tables and graphs to show the effects **Summarise**, using scientific terminology, the relationship between temperature and states of matter. Explain the three states of matter of water and how temperature affects its state. **Create** a testable **hypothesis** about states of matter, carry	**Materials** **Observe and describe** materials on the basis of their hardness, solubility, conductivity and their response to magnets. **Carry out** fair tests to group materials (follow instructions) **Label** materials, including insulators and conductors using a range of scientific vocabulary. **Carry out** fair tests to assess the suitability of everyday materials for a purpose (follow instructions) Adapt a comparative test to group materials. Predict the outcomes of your test. Modify a fair test to group materials. Predict the outcomes of your test. **Devise** an experiment that **proves or disproves** a **hypothesis** you have created about the properties of materials. Apply your understanding of the properties of materials to explain why a range of everyday items have been made from a particular material. **What might happen** if a bird sits on a live, uninsulated power line? **(propose)** **Explain the concepts** you are using to give your answer. **Rocks, Soils and Fossils** No new skills to be covered. **Solids, Liquids and Gases** **Observe** (through direct experience) and **describe** materials as soluble or non-soluble. **Observe** and **describe** the effect of evaporation of a solution on a substance (solute) that has dissolved in a liquid (solvent) **Relate, citing evidence,** your understanding of solutions to your understanding of the water cycle. **Observe and describe** how items may be separated through filtering, sieving and evaporation. Experiment with ways to separate pebbles and silt in a solution of salt. Explain your methods and summarise your results.	**Materials** No new skills to be covered. Just revision of previous skills and knowledge through a range of new activities. **Rocks, Soils and Fossils** No new skills to be covered.

			Devise other hypotheses like this and test them. **<u>Rocks, Soils and Fossils.</u>** No coverage. **<u>Solids, Liquids and Gases</u>** No coverage.	**Observe and name** different types of soils. **Find out and describe** how soil is formed from rocks and organic matter. **Name** the 'parent' materials of different types of soils. Explain weathering. Compare and contrast different soils. **Categorise** soils using a range of criteria. **Test soils** in various ways, to identify them. **Recommend** plants for different soil conditions and explain why. **Apply knowledge** to answer True or False questions: Alluvial soils are richer in nutrients than most other soils. **Investigate and relate** the flooding of the River Nile to knowledge of soils. **<u>Solids, Liquids and Gases</u>** No coverage.	out tests and **prove or disprove** the hypothesis. **Describe** the water cycle. **Observe** evaporation. **Observe and describe** the different rates of evaporation in different temperatures. Graph the relationship between temperature and evaporation. **Summarise** the results. **Suggest** practical uses for the relationship between temperature and evaporation. .	**Is there a way** to recover water after recovering a substance from a solution after evaporation? **(propose) Prove it.** **Categorise** changes as reversible or not reversible, and **give examples**. **Observe and describe** how mixing is reversible. **Observe and describe** how dissolving a substance into a solution is reversible. **Observe and describe** how changes of state are reversible. Demonstrate reversible changes by graphing the temperature of water as it changes state from a liquid to a solid and from a solid to a liquid, and identify patterns between temperature and state. Summarise findings. **Always, sometimes or never?** Changes to materials that are reversible require something else to change first before they can change? **Cite evidence.** **Observe and describe** how burning a material creates a new material and is not reversible. **Observe and describe** how oxidation of (e.g. of steel) creates a new material and is not reversible. **Observe and describe** how adding an acid (e.g. to bicarbonate of soda) creates a new material and is not reversible. **True or False?** Changes in temperature cause only reversible and not irreversible changes. **Cite evidence.**	

<u>End Outcomes for Chemistry</u>

<u>EYFS</u>

Children know about similarities and differences in relation to places, objects, materials and living things. They talk about their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.

<u>Year 1</u>

Pupils will be able to name everyday materials and identify their properties. They will be able to explore and experiment with a wide variety of materials, including brick, paper, fabrics, elastic and foil. Simple tests will have been carried out to explore the best material for certain objects, e.g. an umbrella, dog basket, leotard, bookshelf.

<u>Year 2</u>

Pupils will know how some materials can be used for more than one thing, or that different materials can be used for the same thing. Pupils can think about how properties of materials make them suitable or unsuitable for particular purposes. They also, might find out about people who have developed new materials, e.g. John Dunlop, Charles Macintosh or John McAdam.

Pupils are able to compare everyday materials around school, with those used in other places, by observing, identifying, classifying and recording observations. Pupils will be able to identify how some materials can change shape by squashing, bending, twisting and stretching.

<u>Year 3</u>

Pupils will have explored different kinds of rocks and soils, including those in the local environment. Pupils will be able to group rocks on the basis of their properties and simple physical properties. They will be able to describe in simple terms how fossils are formed and recognise that soils are made from rocks and organic matter.

<u>Year 4</u>

Pupils will have observed water as a solid, liquid and a gas and should have recorded the changes to water when it is heated or cooled. They will know the relationship between temperature and evaporation. Pupils will be able to name solids, liquids and gases and describe their properties. They will know the effect of heating and cooling on materials and will be able to record observations in tables and graphs. They will be able to describe the process of the water cycle and explain the process of evaporation and observe what happens to evaporation at different temperatures.

<u>Year 5</u>

Pupils will have explored and compared the properties of a broad range of materials. They will have explored reversible changes, recognising that melting and dissolving are different processes. They will have explored changes that are difficult to reverse. They will know why and how a solution is formed and relate this to the water cycle. They will have experimented with how to separate solids from solutions and will be able to categorise changes as reversible or not reversible and provide examples. They will also have found out about how chemists create new materials, e.g. Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.

Year 6
Pupils will know why a range of everyday items have been made from a particular material, through completing a range of fair tests. They will also be able to compare and group materials based upon their properties.

Physics	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
NC Skills for Electricity **NC Skills for Movement, Forces and Magnets.** **NC Skills for Light and Seeing.** **NC Skills for Sound and Hearing.** **NC Skills for Earth's Movement in Space**	N/A	**Electricity** No skills to be covered. **Movement, Forces and Magnets** No skills to be covered. **Light and Seeing** No skills to be covered. **Sound and Hearing** No skills to be covered. **Earth's Movement in Space** **Seasonal Changes** **Name** times of the day. **Match** the Sun's position in the sky at different times of the school day. **Observe and describe** the Sun's position in the sky at different times of the school	**Electricity** No skills to be covered. **Movement, Forces and Magnets** No skills to be covered. **Light and Seeing** No skills to be covered. **Sound and Hearing** No skills to be covered. **Earth's Movement in Space** **Seasonal Changes** **Show how** you might know roughly what time of day it is by looking at the position of the Sun. **(apply knowledge)** **Think of a way** to prove that it is lunchtime using the Sun. **Organise** images or objects from each season into categories. Explain choices for categories. **Always, sometimes or never?** It is warm and dry during	**Electricity** No skills to be covered. **Movement, Forces and Magnets** **Plan** and **carry out** a fair test to show how different surfaces affect movement of objects and/or how different inclines affect movement. **Record results** and explain conclusions, using the word 'Friction' appropriately. **Connect** the design of car tyres to your understanding of friction. **Observe** and **illustrate** how objects need a contact force for them to move. **Name** the contact forces that move objects. **Observe and illustrate** how magnetic forces act at a distance. **Experiment** with magnets to see if magnetism can act through materials, e.g.ice Identify any patterns in the type and amount of material the force is acting through. **Observe and describe** how magnets attract or repel each other. **Observe** and **describe** that magnets attract some materials and not others. **(name)** **Experiment** with iron fillings to see how they act when magnets attract and repel each other. **Record** findings and explain what happens. **Explain the concept of magnetic fields.** **Observe** and **complete** tables that **describe** everyday	**Electricity** **Identify and name** common electrical appliances. **Label** appliances that run on high and low voltage. **Identify and describe** sources of electricity for appliances, including mains, battery, solar and others. Explain the similarities and differences between a 240 volt, 40- watt halogen bulb and a 12 volt, 6 watt LED light bulb. **Investigate** battery-powered road cars and draw some **conclusions** about their benefits and problems. **Follow instructions** to create a series circuit. **Label** the components of the circuit. Make a range of series circuits containing different components and **explain the similarities between the circuits** **Explain the concept** of a series circuit and **recommend** some **general** rules. **Complete** incomplete circuits by adding the correct components. **Answer questions** about the completeness of various circuits. **Predict** the effect of changing the arrangement of the components of a circuit (some of which maintain a circuit and others that do not) Experiment with the effect of placing more than one bulb in a series circuit and summarise findings. Find and rectify faults **(solve non-routine problems)** for incomplete circuits. **Observe and describe** the effect of using switches in a circuit. **Complete** circuit diagrams, showing and **labelling** switches. Explain why opening and closing switches affects a series circuit. **Observe and record** how different materials act as conductors or insulators of electricity. **Observe** the effect of some poor and good conductors and **label** materials as poor or good conductors. **Categorise** materials on the basis of their conductivity.	**Electricity** No skills to be covered. **Movement, Forces and Magnets** **Observe and describe** the effect of the force of gravity. Interpret data about the rate that different materials fall towards Earth. Summarise findings. Which will reach Earth first if dropped from the same height: 1kg of feathers or 1kg of steel? **Explain concepts.** **Observe and describe** the effect of air resistance. **Observe and describe** the effect of water resistance. **Observe and describe** the effect of friction. **Describe** these forces as drag forces. **Apply** your knowledge of friction to positive applications. Explain your ideas. **Relate** the size of a drag force to the size of the object it is acting on. **Observe and describe** how objects tend to slow down because of drag forces. **Always, sometimes or never?** The slowing effect of drag forces can be overcome if an object is driven. **Explain concept, make generalisations**. **Observe and describe** how forces and motion can be transferred through gears, pulleys, levers and springs. **Label** the forces and **draw** the directions in which they transfer. **Apply** your knowledge of forces and movement to make a working mechanism. Can a rotary motion be changed into a linear (up and down) motion? **Prove or disprove.** **Observe and describe** the effect of changing gears on a bicycle. **Observe and describe** the effect of using a lever to try to move a heavy object **Observe and describe** the effect of using a pulley, or geared pulleys to lift heavy objects. **Apply** knowledge of gears, pulleys and levers to demonstrate and explain how a small force can have a greater effect.	**Electricity** **Observe and describe** the effect of changing the number and voltage of cells used in a series circuit. Experiment with, explain and demonstrate the pattern between the voltage of cells and the brightness of a bulb. **Suggest** why a bulb or buzzer may stop working when the voltage is increased. **Observe and describe** the effect of placing extra bulbs or buzzers into a circuit and how this can be overcome by increasing the number and voltage of cells. **Predict** the outcome of placing various components into an electrical circuit and support predictions. **Investigate** the concept of resistance and **prove** or **disprove** that components, including wire, are resistors. Is it possible to make your own register? **Suggest, prove.** **Label and learn** the recognised symbols for representing components in a circuit diagram. Make circuits then represent them in circuit diagrams, **applying** component symbols appropriately. How do the images of recognised symbols **relate** to their function? **Movement, Forces and Magnets** No new skills to be covered, just revision of previous skills through some new activities.

		day. Describe shadows **Name** the four seasons. **Match** key features to the season it occurs in. **Notice and describe** the key features of each season. **Observe and record** the weather over four seasons. **Describe** the weather in a named season. **Describe** how day length varies in each season. **Explain in simple terms** why day length varies in each season.	summer (link to geography). **Compare and contrast** weather and day length across the four seasons. Identify patterns in day length across the four seasons. **Plan** some activities that would be suited to each season.	materials as 'attracted' or 'not attracted' to magnets. Explain why some materials are attracted to magnets and others are not. **Label** the north and south poles of magnets and **Explain why we call parts of the Earth, North and South poles.** **Light and Seeing** **Name** some safety rules to avoid damaging your eyes with light from the Sun. **Observe** and **record** the effect of light in seeing things. **Answer questions** about the effect of light on seeing. **Describe** darkness. Explain the relationship between light and seeing. **True or False?** The Sun is the only natural light source in our solar system. **Observe** light reflected from surfaces. **Describe** the effect of light reflecting from surfaces. **Label** a number of effects of reflection. Experiment with light reflecting from a variety of different surfaces. **Always, sometimes or never?** Dark surfaces do not reflect light as well as those that are light. **Observe** and **record** the effect of blocking light with solid objects. **Name** the effect and **describe** what is happening. **True or False? Night-time is a shadow.** **Observe and record** the length of shadows at different times of the day. **Observe and record** how the size of a shadow changes when the source of light is moved closer or further away from the object causing the shadow.	Experiment with materials that conduct but also resist the flow of electricity and summarise findings. **True or False?** Everything on Earth either conducts or does not conduct electricity, including humans. **Movement, Forces and Magnets** No skills to be covered. **Light and Seeing** No skills to be covered. **Sound and Hearing** **Name** a variety of sources of sound. **Recognise** a variety of sounds. **Categorise** sounds. **Observe** how we hear sounds with our ears. **Illustrate** that ears allow us to hear sounds. **Compare and contrast** how loud and quiet sounds are made. **Experiment** with stringed musical instruments to discover how high and low notes are made and **explain** your findings. Suggest a way to prove the relationship between vibration and pitch. **True or False?** Higher notes are louder than lower notes. **Suggest** reasons why whales and dolphins can communicate over long distances. Air is not a very good medium for transmitting sounds. **Do you agree?** **Experiment** with, **explain** and **demonstrate** the **pattern** between pitch of sound and the features of the object that produced it. **Relate** your understanding of pitch to musical instruments. **Listen** to and **describe** sounds through a variety of mediums. **Draw** a **labelled** diagram showing how vibrations travel through a medium to the ear. **Observe and describe** differences in the volume of a sound and the strength of the vibrations that produced it. Experiment with and begin to explain and demonstrate the pattern between the volume of a sound and the strength of the vibrations that produced it. **Relate** understanding of volume to a range of orchestral instruments. (e.g. How does a trombone player alter the strength of the vibrations he or she creates?)	Using a pulley allows a small force to have a greater effect but increases the amount of pulls one has to make. Make **generalisations about the relationship** between forces and effect. **Light and Seeing** No new skills to be covered. **Sound and Hearing** No new skills to be covered. **Earth's Movement in Space** **Describe** the movement of the Earth relative to the Sun. **Label and describe** our solar system. **Answer questions** about the scientists who first observed the Earth's movement around the Sun. **Describe** how the movement of the Earth gives rise to seasonal changes. **Explain why** the Earth's movement gives rise to the seasons. **Explain** why the effect of the Earth's movement on seasons is more acute further away from the equator. **Relate** knowledge of the Earth's movement relative to the Sun to time zones. Assess the **significance** of this to our daily lives. At any time of day it is always 5 o'clock somewhere on Earth. **Do you agree?** **Identify** the Moon and Earth and label them on a diagram. **Describe** the Moon's movement relative to the Earth. **Answer questions** about the Moon's movement relative to the Earth. **Observe, name and record** the phases of the Moon. **Explain** why the Moon's movement affects the tides of oceans and seas on Earth. Explain how we can predict the times of high and low tides. **Explain the concept** of a leap year. **Observe** pictures and videos of the Sun, Earth and Moon and **describe** them using mathematical vocabulary. **Explain**, using your knowledge of gravity, why the Sun, Earth and Moon are almost spherical. **Investigate** reasons why planets and moons are not completely spherical. Explore terms such as 'equatorial bulge' and suggest an	**Light and Seeing** **Draw and label** diagrams to show how light travels. **Experiment** with ways that **demonstrate** how light travels. **Predict** where light will appear after hitting a reflective surface. **Investigate** whether light can ever 'bend' around corners(diffraction) and present information on this. Does blocking light prove that it travels? **(reason, investigate)** **Draw and label** diagrams that show how objects are seen. **Observe and describe** how light diverges from a source. Experiment with making or using a periscope to demonstrate how objects may be seen. Explain what is happening to the light. **True or False?** Light is invisible. **Draw and label** diagrams that show how shadows are formed and that the size of the shadow may be predicted when the position of the source of light changes. Explain why shadows are 'longer' in the winter and 'shorter' in the summer. **Is it possible** that a shadow can be formed that is smaller than the object that created it? **(reason)** **Describe** how divergent light from a source affects the size of shadows. **Draw and label** diagrams to explain how we see. Explain and demonstrate why we cannot always see all of the Moon. **Investigate and present information** on how objects, such as a stick, appear to bend when placed in water. (refraction)

				Explain why shadows change size. **Explain** the relationship between the height of a light source and the object that is causing the shadow. **Sounds and Hearing** No skills to be covered. **Earth's Movement in Space** No skills to be covered.	**Observe and describe** differences in sounds that are close to and far away from their sources. Experiment with, explain and demonstrate the pattern between the volume of a sound and the distance from its source. Why might a thunderclap sound loud to some and faint to others? **Suggest, reason.** **Plan and conduct** a fair test into which material best reduces the sounds we hear. **Earth's Movement in Space** No skills covered.	experiment that would **prove** this phenomenon. **Draw, label and describe** how the Earth's rotation gives rise to day and night. **Explain** what a sundial is and how it works, in simple terms. **Explain** and demonstrate how and why a sundial, used to tell the time, works. At night, sundials do not work. **Suggest or investigate** other ways you could tell the approximate time using views of the night sky.	**Sound and Hearing** No new skills to be covered. **Earth's Movement in Space** No new skills to be covered.
End Outcomes	**EYFS** N/A **Year 1** Pupils will be able to name the times of the day and observe the sun's position in the sky at different times. They will know the names of the 4 seasons and their features. Pupils will have made observations of the weather over the 4 seasons and recorded these observations. They will be able to describe the weather in a named season. **Year 2** Pupils will know how to tell the approximate time of day by looking at the position of the sun. They will be able to organise images or objects into seasons and explain their choices and will be able to identify patterns in day length across the 4 seasons. **Year 3** Pupils will know the meaning of friction and use it to describe the movement of objects on different surfaces and will be able to name contact forces that move objects. Pupils will have observed that magnetic forces can act without direct contact, unlike most forces where direct contact is necessary. They will have explored the behaviour and everyday uses of different magnets. Pupils will have explored what happens when light reflects off a mirror or other reflective surfaces and answered questions about how light behaves. They will have been given the opportunity to look for and measure shadows and find out how they are formed and what might cause them to change. **Year 4** Pupils will be able to identify and describe sources of electricity for appliances and name home appliances that run on high and low voltage. They will be able to create a series circuit and label the components in it, also complete incomplete circuits. They will be able to observe and describe the effect of using switches and will know what a conductor and insulator is and name some poor and good ones. Pupils will have constructed simple series circuits, trying different components and use their circuits to create simple devices. Pupils will be able to draw the circuit as a pictorial representation; conventional circuit symbols do not have to be used at this stage. Pupils will also have been taught about how to work safely with electricity. Pupils will have explored and identified the way sound is made through vibration in a range of different musical instruments from around the world and will have found out how the pitch and volume of sounds can be changed in a variety of ways. **Year 5** Pupils will be able to use models to help them explain day and night. They will know that the Sun is the centre of our solar system and that it has 8 planets. They will understand that a moon is a celestial body that orbits a planet. Pupils will be able to explain how we see, through the use of diagrams and know how divergent light affects the size of shadows. Pupils will be able to explain how seasons are created by the Earth's movement and how this changes the further away from the Equator it is. They will know why planets and moons are not completely spherical and how a sundial works. Pupils will have explored falling objects and raised questions about the effects of air resistance, e.g. observe parachutes and sycamore seeds. They will have experienced forces that make things begin to move, get faster or slow down. Pupils will have explored the effects of friction on moving objects and explored the effects of levers, pulleys and simple machines on movement. They will know how Galileo Galilei and Isaac Newton helped develop the theory of gravitation. **Year 6** Pupils will have explored the way that light behaves, including light sources, reflection and shadows. They will be able to talk about what happens and make valid predictions. They will be able to construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. They will be able to represent a simple circuit in a diagram using recognised symbols. Pupils will be able to apply knowledge of magnetic poles, gravity, air and water resistance and drag forces.						