Twickenham PRIMARY ACADEMY

Science Skills and Knowledge Progression

Intent

Science teaching at Twickenham Primary Academy

Builds on previous experience and encourages the use of scientific vocabulary to help children develop their scientific knowledge.
For all children, it is hands-on and practical, inspiring and challenging.
It encourages children to ask and answer questions, helping in their exploration of the world in which they live.
Using a variety of diverse scientists and role models promotes inclusion and helps children connect their learning with future scientific careers.
Creates scientist of the future and inspires their curiosity.

Implementation

Our Science curriculum challenges all children. It builds on the knowledge gained in EYFS and ensures that the National Curriculum Programme of Study is fully covered. 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. 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 and as part of UTW in EYFS. Each topic begins with a knowledge organiser, 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 can be linked to all other curriculum areas where appropriate.

Impact

We our children to be curious and have the knowledge and skills to be able to understand explore the world around them.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 1	Weather and Seasons	Materials	Animals incl Humans and Senses		Plants	
Year 2	Materials		Living Things and their habitats	Animals incl Humans	Plants	
Year 3	Forces and Magnets	Rocks	Animals incl Humans		Light	Plants
Year 4	Animals incl Humans	Living Things and their habitats	Electricity		States of Matter	Sound
Year 5	Forces -	Earth and Space -	Properties and Changes of Materials		Living Things and their habitats	Animals incl Humans
Year 6	Light	Evolution and Inheritance	Animals incl Humans		Electricity	

Science

The science curriculum provides pupils with an understanding of the following **domains of knowledge.** Disciplinary knowledge is taught and embedded within the teaching of each unit of substantive knowledge.

Substantive Knowledge: (Concepts, models, laws and theories)

Biology

- **Living things and their environment** (Animals, humans, plants, habitats)
- **Reproduction, inheritance and evolution** (Evolution, inheritance, life processes, life cycles)

Chemistry

- **States of matter** (Solids, liquids, gases)
- **Materials (properties and changes)** (Reversible/irreversible changes, rocks, fossils)

Physics

- **Energy** (Light, sound, electricity)
- **Forces** (Friction, air resistance, gravity, magnets)
- **Earth and space** (Seasons, day and night, solar system and beyond)

Disciplinary knowledge: Working scientifically

- • **Methods used to answer questions** (use of models, classification, correlations and patterns, experimentation, fair testing)
- • **Using apparatus and techniques** (accurate measurement, collecting and recording data, carrying out procedures safely and accurately)
- • **Data analysis** (processing and presenting data, exploring relationships, communicating results in tables / graphs, identifying correlations)
- • **Using evidence to develop explanations** (using evidence / scientific knowledge to draw conclusions, explain laws, models, concepts and findings)

Key concepts: (not exhaustive)

Through the science curriculum, pupils will develop an understanding of the following key concepts. These concepts are revisited through different units as pupils move through the school. By the end of primary school, children will know and understand these key concepts.

Biology

- • **Organisms require a supply of energy and materials:** Living things are special collections of matter that reproduce, use energy and grow. Food provides materials and energy for life and growth. Plants and bacteria use energy from the sun to generate food. Animals break down food and are ultimately dependant on green plants for energy. In any ecosystem there is competition for the energy and materials needed to live and reproduce.
- • **Genetic information:** Genetic information is passed down from one generation of organisms to another. Genes determine the development and structure of organisms
- • **Evolution:** The diversity of organisms is the result of evolution. Different kinds of life, animals, plans and microorganisms, have evolved into different forms best suited to the environments in which they live. Organisms not able to respond sufficiently to changes in their environment become extinct

Chemistry

- • All matter (stuff) in the universe is made of tiny building blocks.
- • **Materials (properties and changes):** The arrangement, movement and types of building blocks of matter, and the forces that hold them together/push them apart, explain all the properties of matter (eg: hot/cold, soft/hard, light/heavy etc…)
- • **States of matter**: Matter can change if the arrangement of these building blocks change (eg: chemical reactions)

Physics

- • The universe follows unbreakable rules that are all about forces, matter and energy
- • **Forces** are different kinds of pushes and pulls that act on all the matter in the universe**.** Changing the movement of an object requires a force to be acting on it. Gravity is a universal force of attraction between all objects, however large or small
- • **Energy:** There are many different forms of energy eg: light, sound, electricity, heat and wind. Energy can be transferred from one object to another and can cause changes. The total amount of energy in the universe is always the same but energy can be transformed when things change or are made to happen

Earth Science

- • **The earth in relation to the universe:** The Earth is one of 8 planets orbiting the sun. Our solar system is a very small part of one of millions of galaxies in the universe.
- • **The earth spins on its axis:** The Earth is tilted and spins on its axis leading to day and night, the seasons and climate

Enquiry strategies

As part of **working scientifically** which is embedded throughout all units, pupils will also learn to use a variety of **enquiry strategies** to answer scientific questions. Different questions lead to different types of enquiry and are not limited to fair testing. By the end of primary school, children will be able to use these enquiry strategies confidently and know that different strategies may be needed at different times.

- **Observing over time:** (observing or measuring how one variable changes over time)
- **Identifying and classifying:** (identifying and naming materials/living things and making observations or carrying out tests to organise them into groups.)
- **Looking for patterns:** (making observations or carrying out surveys of variables that cannot be easily controlled and looking for relationships between two sets of data)
- **Comparative and fair testing:** (observing or measuring the effect of changing one variable when controlling others)
- **Answering questions using secondary sources of evidence:** (answering questions using data or information that they have not collected first hand)

As well as this, pupils will learn about:

- **Using models:** (Developing or evaluating a model or analogy that represents a scientific idea, phenomenon or process)

Second order concepts (disciplinary concepts)

Through each unit of science, the following second order concepts are explored:

- **Responsibility:** (working safely, how science can solve problems, climate change and sustainability)

- **Similarity and difference:** (making comparisons, finding patterns, noting differences and drawing conclusions)
- **Cause and consequence:** (models and laws, reactions between materials, observing processes)
- **Continuity and change:** (observing what changes and what stays the same)
- **Significance:** (significant scientists, discoveries, laws, models and theories)
- **Written and oral expression:** (Using scientific terminology, evaluation, drawing conclusions, objectivity, explaining processes, describing and explaining patterns, presenting and interpreting data)

End points:

By the end of KS1, the basic fundamentals of the biology strand have been established. Pupils explore animals, humans and changes within environments and begin to develop simple scientific vocabulary linked to this. Children use different types of scientific enquiry to answer a range of questions. Children are encouraged to ask questions, discuss their findings and present the ideas in a variety of ways.

By the end of KS2, pupils have a deep understanding of a range of scientific ideas. Children are able to link scientific ideas to the world around them and, through research, understand how scientific ideas are developed over time. Children use secondary sources of information and practical enquiry to draw conclusions and find things out.

1. Pupils have an understanding of the key domains of knowledge and can use key concepts to make links between the domains
2. Pupils can ask questions and make observations about the world around them using scientific knowledge
3. Pupils can analyse data and articulate evidenced conclusions
4. Pupils are able to follow and design scientific enquiries
5. Pupils have an understanding of some of the major issues facing our planet and an appreciation of the importance of science to wider society

Pedagogy in Science:

The structure of a sequence of learning or an individual science lesson will vary, depending on the aspect of science being taught or the area of scientific enquiry that is required.

Science lessons are carefully sequenced to ensure that pupils can develop connections and embed their understanding across a range of scientific concepts. Science topics are covered in a cohesive order to ensure that pupils can fully access that aspect of learning and to build on prior knowledge. Some modules are revisited throughout to ensure that pupils fully understand complex concepts.

Scientific enquiry can be found at the heart of all science lessons and over time develops a range of skills. Pupils are challenged in their scientific thinking through a range of questions, investigations and problems. This carefully supports the scientific knowledge learnt through each unit further embeds pupil understanding.

Pupils will be encouraged to develop a range of scientific enquiry skills, not just fair testing, and by the end of Key Stage 2 they will have a greater understanding of how to select the most appropriate skill to support their practical work.

Pupils are encouraged to discuss their understandings with one another and their class teacher. Pupils are encouraged to ask questions and suggest improvements for practical science enquiry.

Pupils record their science learning and understanding in a range of ways and are encouraged to do so during each science unit.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Working Scientifically NC Skills and Knowledge	• 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

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.

Biology	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
NC Skills and Knowledge for Plants **NC Skills and Knowledge for Animals and Humans** **NC Skills and Knowledge for Living Things**	Plants -To identify and name a variety of common garden and wild plants -To identify and name deciduous and evergreen trees -To identify and describe the basic structure of a variety of common flowering plants, including trees. -To observe and name changes across the 4 seasons	Plants -To observe and describe how seeds and bulbs grow into mature plants. -To find out and describe how plants need water, light and a suitable temperature to grow and stay healthy -To identify and name the parts of common trees and plants -To know that many plants provide us with food	Plants -To identify the parts of a plant and describe the functions of those parts -To describe similarities and differences in leaves and describe the function of them -To describe similarities and differences in roots and describe the function of them -To explain the way in which water is transported in plants -To name the main stages in the life cycle of a flowering plant and put them in order -To understand pollination, seed formation and seed dispersal	Plants No new coverage, recap key facts/knowledge from Y3 at the start of 'living things'	Plants No new coverage, recap key facts/knowledge from Y4 at the start of 'living things'	Plants No new coverage, recap key facts/knowledge from Y5 at the start of 'living things'

NC Skills and Knowledge for Evolution and Inheritance.	Animals incl Humans and Senses - To identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals -To identify and name a variety of common animals that are carnivores, herbivores and omnivores - To describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets) - To identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	Animals incl Humans -To find out about and describe the basic needs of animals, including humans, for survival (water, food and air) -To describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene -To notice that animals, including humans, have offspring which grow into adults	Animals incl Humans To identify and name the important things that need to be considered in order to survive. To name the main food groups and give examples of foods that belong to each group. To understand a balanced diet To explain the effects of not having a balanced diet To know and name some vitamins and minerals. To identify similarities and differences between different animals' skeletons To explain the three functions of a skeleton To identify and name the main bones in a skeleton. To identify different muscles in our body and what they do	Animals incl Humans To know where our food goes after it has been eaten. To name and sequence the basic parts of the digestive system. To name and recognise the types of teeth in humans. To explain the difference between the teeth of a child and an adult To know and understand the function of the different types of teeth. To describe different ways to look after our teeth. To know why it is important to look after our teeth. To identify the organs in which food is broken down. To describe how food is broken down in the digestive system. To know and explain the role of each of the parts of the digestive system. To understand the difference between a chemical and mechanical process for breaking down food. To know what are food chains and food webs. To understand and correctly use the terms producer, consumer, predator and prey. To construct food chains and webs for a particular habitat To sort some animals according to what they eat by looking at their skulls, and in particular their teeth.	Animals incl Humans To name and explain the stages of a human life cycle. To compare the human life cycle with that of other mammals. To know what puberty is. To identify differences between girls and women. To describe the changes that happen to girls during puberty. To give reasons for some of the changes. To identify differences between boys and men. To describe the changes that happen to boys during puberty. To give reasons for some of the changes. To compare puberty in males and females.	Animals incl Humans -To describe how the human circulatory system works - To investigate and describe the main functions of the heart - To pose and answer a range of relevant questions about how blood transports gases round the body - To identify the contents of blood and describe their function - To explain the function of valves, veins, arteries and capillaries in the human circulatory system - To explain how water helps humans' and other animals' bodies to function - To describe the impact of diet and exercise on human health - To identify criteria to judge whether a drink or snack is healthy - To investigate variables that affect pulse rate - To identify the impact exercise has on the way the body functions - To identify and present the long-term effects on the body of drug use - To describe the long-term effects on the body of smoking
	Living Things and their habitats No coverage	Living Things and their habitats -To explore and compare the differences between things that are living, things that are dead and things that have never been alive	Living Things and their habitats No new coverage	Living Things and their habitats -To make careful observations of animals -To know that living things can be grouped (classified) in different ways according to their features.	Living Things and their habitats -To know the main stages of an animal life cycle -To compare the life cycles of different animals	Living Things and their habitats No coverage

		-To identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other -To describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food -To identify and name a variety of plants and animals in their habitats, including microhabitats.		-To use keys to group and identifying animals -To classify vertebrates into groups using their key characteristics -To recognise characteristics of some of the main invertebrate groups -To make observations of leaves in order to classify them -To know and name similarities and differences between deciduous trees -To make observations of flowers that appear at different times of the year -To use observations of flowers to make a key for classifying and identifying the plants -To know and describe some negative ways that humans change the environment -To know and describe some positive ways that humans change the environment -To know what happens when a food chain is broken -To understand and explain some implications of global habitat destruction	-To know what a mammal isand describe the common characteristics of different types of mammal -To describe the life cycle of a mammal -To know what a bird is and describe the common characteristics of different types of bird -To describe the life cycle of a bird -To know how some mammals and birds reproduce -To identify similarities and differences between the life process of reproduction in mammals and birds -To explain that mammal and bird reproduction is sexual reproduction, requiring two animals, one male and one female -To know what an amphibian is and describe the common characteristics of different types of amphibian -To describe the life cycle of a amphibian -To know what an insect is and describe the common characteristics of different types of insect -To describe the life cycle of a insect -To know how some amphibians and insects reproduce -To identify metamorphosis as a stage in the life process of reproduction that is specific to amphibians and insects -To explain that amphibian and most insect reproduction is sexual reproduction, requiring two animals, one male and one female -To describe the life process of sexual reproduction in flowering plants, including pollination and fertilisation -To name different parts of the flower and explain their role in sexual reproduction -To recognise that flowers are not all the same and identify how they are different -To describe how plants can reproduce asexually, by creating new plants from different parts of the parent plant rather than by producing seeds	
	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 -To identify ways in which living things of the same kind vary and to begin to think about why these variations exist - To recognise how organisms can be bred to

						select particular characteristics in their offspring - To observe the effects of the environment on plants and design an experiment to investigate some of these effects - To investigate the effect of environmental variables on plants and interpret the results - To explore ways in which living things are adapted to suit the environments in which they live and to help them survive - To evaluate variables that contribute to the extinction of living things - To describe animal and plant adaptations and explain how the characteristics of the individuals in populations can change over time - To recognise that fossils allow us to study things that have lived in the past and provide evidence of evolution - To describe the process of natural selection

End Outcomes for Biology

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	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
NC Skills and Knowledge for Materials.	**Materials** -To identify and name a variety of everyday materials -To distinguish between an object and the material from which it is made -To describe the simple physical properties of a variety of everyday materials -To compare and group together a variety of everyday materials on the basis of their simple physical properties	**Materials** -To identify and compare the suitability of a variety of everyday materials for particular uses -To find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching			**Properties and Changes of Materials** -To name different materials and describe their properties -To make comparisons between different materials -To classify a variety of materials according to their properties -To compare and contrast different solids according to their properties, including their hardness -To describe how the hardness of solids differs -To explain what is different about the structure of a soft and a hard solid -To compare and contrast the properties of different liquids, including viscosity -To describe how viscosity varies from liquid to liquid -To identify the properties of a variety of different metals -To describe how the properties of different metals make them suitable for particular uses -To identify different plastics and their properties -To explain how the properties of different plastics make them suitable for particular uses -To understand that materials can be mixed but often they can be separated -To describe and explain the process of sieving mixtures to remove particles of different sizes -To identify and name some solids that dissolve and some that do not -To identify when a solution has become saturated and explain why -To identify variables that might affect the rate at which a solid dissolves -To describe how dissolved material can be separated from a liquid -To explain the processes of evaporation and condensation -To describe and explain how to separate removing solids from solutions using the process of evaporation -To give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic -To describe different changes in materials when they are brought together and to be able to recognise them as reversible or irreversible	
NC Skills and Knowledge for			**Rocks**			

Rocks, Soils and Fossils			-To know and name the three types of rocks which are formed naturally -To understand how the three types of rocks are formed -To describe different properties of rocks and group them accordingly -To know that some rocks are hard and some are soft -To know that rocks can be permeable, absorbent or impermeable -To describe how the appearance of rocks changes over timeand possible causes -To know what fossils are and how they are formed			
NC Skills for Solids, Liquids and Gases.			recognise that soils are made from rocks and organic matter	**States of Matter** -To compare materials using their properties -To describe the properties of solids, liquids and gases -To group materials together according to whether they are solids, liquids or gases -To observe that some materials change state when they are heated or cooled -To define melting and freezing -To describe what happens when a solid melts -To describe what happens when a liquid freezes -To know how to melt or freeze materials -To identify the melting and freezing point -To know and explain that spaces that appear to be empty are filled with air/gases -To understand what is happening when something dries -To understand what happens when a liquid boils -To identify the boiling point -To explain what evaporation and condensation is -To identify where condensation is happening -To understand and explain the water cycle		

End Outcomes for Chemistry

Year 1

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.

Year 2

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.

Year 3

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.

Year 4

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.

Year 5

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	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
NC Skills for Electricity	Electricity No coverage	Electricity No coverage	Electricity No coverage	Electricity identify common appliances that run on electricity. construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. recognise some common conductors and insulators, and associate metals with being good conductors.	Electricity No coverage	Electricity - To represent a simple circuit in a diagram and describe how it works - To use a switch in a simple circuit, show it in a diagram and describe how it works - To demonstrate the effects of changing the current flowing through components in a circuit associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit compare and give reasons for variations in how components function, including the brightness

						of bulbs, the loudness of buzzers and the on/off position of switches use recognised symbols when representing a simple circuit in a diagram.
NC Skills for Movement, Forces and Magnets.	Forces No new coverage	Forces No new coverage	Forces and Magnets To know how a force is required to make something start to move To understand that forces are pushes and pulls To understand that some forces need contact between two objects compare how things move on different surfaces notice that some forces need contact between 2 objects, but magnetic forces can act at a distance observe how magnets attract or repel each other and attract some materials and not others compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials describe magnets as having 2 poles predict whether 2 magnets will attract or repel each other, depending on which poles are facing	Forces No new coverage	Forces -To know what forces are -To measure friction between moving surfaces -To know how the surface	Forces No new coverage
NC Skills for Light and Seeing.	Light No new coverage	Light No new coverage	Light -To understand why we need light to see things and why it is harder to see objects when it gets dark -To know and name light sources -To describe how objects reflect light and know why some objects reflect more light than others -To know how to make things easier to see at night -To describe how a mirror works	Light No new coverage	Light No new coverage	Light To describe how a mirror reflects an image of an object recognise that light appears to travel in straight lines use the idea that light travels in straight lines to explain that

			-To understand how images in mirrors may look different -To identify how shadows are formed -To recognise that shadows are similar in shape to the objects forming them -To know why some objects make better shadows than others -To identify what affects the shape of a shadow -To describe how I can make the size of a shadow change			objects are seen because they give out or reflect light into the eye explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them look at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water, and coloured filters
NC Skills for Sound and Hearing.				Sound -To identify and describe different types of sound -To know how some sounds are made -To make sounds in a range of different ways -To explain how sounds are associated with vibrations -To identify what is vibrating to cause the sound -To describe how sounds travel -To understand how sounds might be changed -To explain what affects the volume of a sound -To measure the volume of the sound produced -To understand that the volume of a sound changes as the distance from the source de-or increases -To know pitch describes how high or low a sound is -To know how to alter the pitch of a sound -To explain how high and low notes are produced		
NC Skills for Earth's Movement in Space	Weather and Seasons To know and name the 4 seasons To know and name different kinds of weather -To observe and name changes across the 4 seasons -To observe and describe weather associated with the seasons and how day length varies	Earth and Space	Earth and Space	Earth and Space	Earth and Space To describe the sun, Earth and moon as approximately spherical bodies And identify the sun as a star. To know the 8 planets in the solar system To describe the movement of the Earth and other planets relative to the sun in the solar system	Earth and Space

					To 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. To understand a moon is a celestial body that orbits a planet. To describe the movement of the moon relative to the Earth and identify and name the phases of the moon, and how it effects tides. To use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. To explain how the length of a year is decided and explain what a leap year means and why we have them. To know how the sun casts shadows at different times of day To understand and explain how the earth's tilt leads to seasonal changes and hours of daylight	

End Outcomes for Physics

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.

EYFS

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Marvellous me	Terrific Twickenham	My place in space	In the Garden	Once upon a time	Animalia
UTW	Describe what they see, hear and feel whilst outside Understand the effect of changing seasons on the natural world around them	Understand the effect of changing seasons on the natural world around them	Recognise some similarities and differences between life in this country and life in other countries Recognise some environments that are different from the one in which they live	Explore the natural world around them Describe what they see, hear and feel whilst outside Recognise some environments that are different from the one in which they live Understand the effect of changing seasons on the natural world around them	Explore the natural world around them, making observations and drawing pictures of animals and plants	Explore the natural world around them, making observations and drawing pictures of animals and plants
Activities	Senses activities	Autumn outside	Space activities	Plants		Mini Beasts