

Skills Overview: Science

Science Rationale:

At St Peter's, we aim to equip all our children with the foundations for understanding the world through a scientific lens. Pupils will be taught units of work that cover and go beyond the requirements of the National Curriculum in the disciplines of biology, chemistry and physics. Pupils will encounter a range of people who have made significant contributions to the field of science and have helped shape our world. This will create a culture where pupils will be inspired to become the scientists of the future.

Pupils will build a body of scientific knowledge as they work through our curriculum. They will learn to ask informative and probing questions. They will also develop a sense of curiosity about the world around us. This will give our children an introduction to fascinating content such as; the inner workings of the human body, animals and the environments they live in, plants and their features, forces in nature, what lies beyond the visible and what lies beyond the planet we live on. Over time their knowledge will deepen, moving from recognising and naming parts of the human body to understanding how our muscles work, how our blood moves around our body and how our nervous system helps us to interact with the world.

Throughout our science curriculum, knowledge is built year on year in a progressive format. Pupils have multiple opportunities to secure and build on their knowledge and understanding as subject content is revisited at points throughout the curriculum. This helps children to master the knowledge and concepts whilst building up an extended specialist vocabulary. This incremental approach helps teachers to identify knowledge gaps and look back at previous content if they need to close gaps in knowledge or understanding. Our lessons are presented in small steps, clearly explained to modelled to reduce cognitive load and encourage children to retain the knowledge that is taught. The aims of each lesson are to provide a clear learning outcome whilst still inspiring a love for science and the history behind it.

Pupils will be encouraged to use the knowledge they learn in Science and apply it across the curriculum. They will test out theories they have learnt in practical experiments. In our curriculum, scientific knowledge is taught first before pupils undertake enquiries. This helps pupils understand the elements of enquiry first, and to make informed observations about the changes they see. As a result of this, pupils are able to gather information, record data and present their findings in various formats such as graphs, posters, presentations and written conclusions forming links between the English and Maths curriculum.

WHOLE SCHOOL SCIENCE OVERVIEW

	Autumn 1 - The Human Body	Autumn 2 - Cycles in Nature	Spring 1 - Light	Spring 2 - Plants	Summer 1 - Rocks	Summer 2 - Forces and Magnets
Year 3	<p>Lessons:</p> <ul style="list-style-type: none"> • The Muscular System • The Skeletal System • The Nervous System • Preparing to Eat • The Digestive System <p>In Year 3, children will learn about voluntary and involuntary muscles and their purpose. They will learn that some muscles, like our heart, move without us consciously thinking about it, but other muscles require us to command them to move.</p> <p>Children will look in more detail at the skeletal system, looking at studying names of bones, joints and their function.</p> <p>Children will learn about the nervous system. They will learn that our brain is an organ that acts as the command centre for the many messages that run around our body through our nervous system. They will understand the importance of our spinal cord which runs through our backbone and the web of nerves that connect to it. Children will learn about reflex actions and their importance if part of our body is in danger.</p>	<p>Lessons:</p> <ul style="list-style-type: none"> • The Four Seasons (prior learning) • Seasonal Cycles in Plants • Life Cycle of a Plant • Animal Migration • Life Cycle of a Frog <p>Building on their understanding of the environment, plants and animals from previous units, children will learn about cycles in nature. They will study patterns, trends and cycles that occur throughout the seasons, in the life of plants and in the life of animals.</p> <p>Children will understand that the tilt of the earth creates our seasons. This knowledge will be built upon in the Year 5 unit on Astronomy. Children will ask and answer questions about the patterns seen in nature as the seasons change. They will look closely and observe changes in the seasons in their own environment.</p> <p>Children will think scientifically about the changes to plants through the seasons, how the increased hours of sunshine in the summer help plants to gain the</p>	<p>Lessons:</p> <ul style="list-style-type: none"> • Light and Dark • Transparent and opaque surfaces • Mirrors and reflection • Shadows • Finding patterns in changing shadows <p>In this unit children will learn that light is an energy that enables us to see, and interact with, the world around us. They will learn there are many different sources of light and the light of the sun is vital for life on earth.</p> <p>Children will work scientifically to find out if materials are transparent or opaque using torches. They will learn that light travels in straight lines and sometimes bounces off from an object or material and that scientists call this reflection. There are frequent opportunities for observing and investigating how light behaves and how materials interact with light during this unit.</p> <p>Going beyond the requirements of the National Curriculum at this stage, children will have the opportunity to investigate mirrors and how light reflects from plane,</p>	<p>Lessons:</p> <ul style="list-style-type: none"> • Botany and Flowering Plants • Requirements for life and growth • Water transportation in plants • Pollination in Flowering Plants • Seed Dispersal <p>This unit builds on directly from Year 2 Plants where pupils learned how to observe and describe seeds and bulbs, found out what plants need to grow and also learned how plants are grown by farmers as crops for people to eat.</p> <p>In this unit, pupils will look more closely at flowering plants, their features and the functions of their features.</p> <p>Pupils will learn that the scientific study of plants is called botany and that what we understand about plants comes from contributions from many botanists over the years. The reason for this is to show real scientists study plants,</p> <p>they look closely at plant specimens, draw and annotate pictures and diagrams, go into the world to look for plants and vitally ask questions about how plants</p>	<p>Lessons:</p> <ul style="list-style-type: none"> • Sorting rocks. • How Rocks are Formed • Permeability • Fossils • Soil <p>This unit introduces key knowledge of rocks including their appearance and simple physical properties.</p> <p>It introduces key substantive knowledge, particularly recognising different types of rock. The unit also introduces disciplinary geology knowledge and how geologists work to find out more about rocks on earth and beyond. Pupils will learn that a geologist is a scientist who studies rocks and will be introduced to some of the things that geologists might study, such as properties of rocks, composition of rocks, and what rocks can tell us about life on earth long ago.</p> <p>When learning about how sedimentary rock forms, children will learn that fossils form when things that have lived are trapped within rock and how this process allows us to learn about plants</p>	<p>Lessons:</p> <ul style="list-style-type: none"> • Forces (Gravity) • Friction • Magnet • Magnetic Poles and Fields • Investigating the strength of magnets <p>This unit introduces pupils to simple forces, including magnetism. In Year 2, pupils began learning about magnets in the unit 'Materials and Magnets'. They began to learn that magnets attract certain metals, but that not all materials are attracted to magnets. This unit will build substantive science knowledge about how forces, such as gravity and magnetism behave. In this unit, pupils will be introduced to forces and will firstly learn about gravity and friction. They will begin to understand the concept that scientists draw conclusions about things they cannot see, like forces, from looking at the effects they have. For example, we cannot see gravity, but we can see a ball fall to the ground when we drop it. Pupils will learn that Sir Isaac Newton was a scientist who thought about why things fall when dropped and developed lots of ideas about the force of gravity.</p>

In addition, children will learn the key parts of the system including the mouth, oesophagus, stomach, small intestine, large intestine and anus. They will also look at types of teeth and their functions including incisors, canine, premolars and molars.

necessary energy to grow bigger.

Children will look at the different types of trees and recognise how the seasons and animal migration patterns are interconnected. Building on their understanding of cycles, children will study the life cycles of plants and animals, specifically flowering plants and frogs. Additional life cycles of living things can be added to add further context. Metamorphosis is introduced as children learn about the changes in the life cycle of frogs. Children will identify the function of different parts of flowering plants and will explore the part that flowers play in the reproduction of flowering plants. This knowledge will be revisited in more detail in a later Year 3 unit studying plants.

concave and convex mirrors. Working scientifically, children will plan and undertake an investigation to answer the question, 'Do shadows stay the same throughout the day?'

Planning this investigation will require children to think about the best ways to investigate things, how to make sure their investigation is fair, and how to record their findings.

Children should understand that the Earth is rotating on an axis, the sun is not orbiting the earth as it may appear from the sun seeming to move across our sky. Children will understand that the sun's position in our sky determines the shape and size of our shadows. Children will see a time-lapse video of a sundial and will learn that this way of measuring time was used thousands of years ago.

At the end of the unit, children will show their learning and understanding of shadows through either drawing a scientific diagram with a short written explanation or an extended piece of writing that answers the question 'Why is light important?' Drawing scientific diagrams and organising writing to explain something will help children to understand how scientists work and communicate their thinking. Alongside the link to History with sundials, this unit also links to Visual Arts in Year 4 where

behave, for example how they reproduce. Therefore, when pupils go on to do some of these things in the subsequent lessons within this unit, they will understand that these tasks require scientific thinking, questioning, exploring and analysing.

As pupils work through this unit they will continue to build an understanding of the diversity of life on Earth. They will also learn that plants have differing needs. They will recognise that plants grow in diverse environments around the world and even within a garden, there are some plants better suited to particular places than others.

Pupils will go on to focus on how plants transport water from their roots to the rest of the plant.

This unit also covers pollination and seed dispersal, two vital parts of the life cycle of a plant. Pupils will learn how animals such as bees are vital for the pollination process and also, in some instances, for seed dispersal. Pupils will learn that germination is the process where a seed begins to grow into a plant, building on knowledge from Year 1 and 2.

and animals from thousands and millions of years ago.

The unit then progresses on to studying the three groups that geologists sort rocks into; sedimentary, igneous and metamorphic. Studying the ways in which rocks can form helps pupils to recognise the difference between rocks, the properties they have and to further understand the landscapes on earth.

One of the properties pupils will study closely is permeability. They will recognise that understanding the permeability of a particular rock is useful for geologists to make decisions about what that rock should be used for. This thinking draws on understanding from Year 1 and 2 Materials, where pupils considered the properties of materials and their purpose.

Building on their knowledge of sedimentary rock, pupils will learn that due to the process of its formation, fossils are most often found in sedimentary rock layers. Pupils will learn that palaeontologists are scientists who study fossils. They will be introduced to the process of fossilisation and will understand that fossils are a record of things that lived on earth many thousands or millions of years ago. They will look closely, where possible, at fossil samples, or images of fossils including those

This will help pupils to develop their disciplinary knowledge, considering how scientists observe and reflect on what they notice before suggesting theories. In the second lesson, pupils will learn about the force of friction. They will compare how things move on different surfaces by investigating how a toy car moves down a ramp. They will select different materials to place on the ramp to see how it affects the car's ability to move down the ramp. They will learn that friction is a contact force, where two objects touch, but gravity is a non-contact force as it can act upon an object alone. Moving through the unit, pupils then build on their prior knowledge of magnets from Year 2. They will observe how magnets attract or repel each other and attract some materials and not others. They will compare and group materials on the basis of whether they are attracted to a magnet and will identify magnetic materials. Pupils then learn about the poles of a magnet and will think about whether two magnets will attract or repel each other, depending on which poles are facing. In the final lesson, pupils will work scientifically to test the strength of different magnets. They will learn that generally, larger magnets are stronger than smaller magnets that are made from the same material, however this is not always the case. Pupils will learn that heating a magnet to high temperatures can weaken its

			children look at how artists represent shadows in their work.		of plants. Finally, pupils will build on their understanding of different rock types and will look closely at the composition of different soils. Ideally with real samples, children will use microscopes and magnifying glasses to look at soil and find out what it is made from. They will learn that scientists use the term 'organic matter' to mean a substance made up of decaying plants, animals and insects. Noticing any small rocks within the soil sample, the pupils will be able to describe the samples and compare them, recognising that like rocks, soils can be different. Finally, pupils will complete an essay (extended piece of writing) to answer this question: What can rocks tell a geologist about our planet? This will give pupils an opportunity to reflect on each lesson of this unit and create a piece of coherent scientific writing that may include labelled diagrams.	magnetic force. They will then test the strength of the magnets they have in the classroom and record their findings. Finally, there are some short assessment tasks suggested and an optional extended writing task that requires pupils to explain what they know about forces and magnets.
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	Autumn 1 - The Human Body	Autumn 2 - Classification of Plants and Animals	Spring 1 - Ecology	Spring 2 - Sound	Summer 1 - States of matter - The water cycles	Summer 2 - Electricity
Year 4	Lessons: <ul style="list-style-type: none"> • The Muscular System • The Skeletal System • The Nervous System • Preparing to Eat • The Digestive System 	Lessons: <ul style="list-style-type: none"> • The Four Seasons (prior learning) • Seasonal Cycles in Plants • Life Cycle of a Plant • Animal Migration 	Lessons: <ul style="list-style-type: none"> • Light and Dark • Transparent and opaque surfaces • Mirrors and reflection • Shadows 	Lessons: <ul style="list-style-type: none"> • Botany and Flowering Plants • Requirements for life and growth • Water transportation in plants • Pollination in Flowering Plants 	Lessons: <ul style="list-style-type: none"> • Sorting rocks. • How Rocks are Formed • Permeability • Fossils • Soil 	Lessons: <ul style="list-style-type: none"> • Forces (Gravity) • Friction • Magnet • Magnetic Poles and Fields • Investigating the strength of

<p>In Year 3, children will learn about voluntary and involuntary muscles and their purpose. They will learn that some muscles, like our heart, move without us consciously thinking about it, but other muscles require us to command them to move.</p> <p>Children will look in more detail at the skeletal system, looking at studying names of bones, joints and their function.</p> <p>Children will learn about the nervous system. They will learn that our brain is an organ that acts as the command centre for the many messages that run around our body through our nervous system. They will understand the importance of our spinal cord which runs through our backbone and the web of nerves that connect to it. Children will learn about reflex actions and their importance if part of our body is in danger.</p> <p>In addition, children will learn the key parts of the system including the mouth, oesophagus, stomach, small intestine, large intestine and anus. They will also look at types of teeth and their functions including incisors, canine, premolars and molars.</p>	<ul style="list-style-type: none"> ● Life Cycle of a Frog <p>Building on their understanding of the environment, plants and animals from previous units, children will learn about cycles in nature. They will study patterns, trends and cycles that occur throughout the seasons, in the life of plants and in the life of animals.</p> <p>Children will understand that the tilt of the earth creates our seasons. This knowledge will be built upon in the Year 5 unit on Astronomy. Children will ask and answer questions about the patterns seen in nature as the seasons change. They will look closely and observe changes in the seasons in their own environment.</p> <p>Children will think scientifically about the changes to plants through the seasons, how the increased hours of sunshine in the summer help plants to gain the necessary energy to grow bigger.</p> <p>Children will look at the different types of trees and recognise how the seasons and animal migration patterns are interconnected. Building on their understanding of cycles, children will study the life cycles of plants and animals, specifically flowering plants and frogs. Additional life cycles of living things can be added to add further context. Metamorphosis is introduced as children learn about the changes in the life cycle of frogs. Children will identify the function of different parts of</p>	<ul style="list-style-type: none"> ● Finding patterns in changing shadows <p>In this unit children will learn that light is an energy that enables us to see, and interact with, the world around us. They will learn there are many different sources of light and the light of the sun is vital for life on earth.</p> <p>Children will work scientifically to find out if materials are transparent or opaque using torches. They will learn that light travels in straight lines and sometimes bounces off from an object or material and that scientists call this reflection. There are frequent opportunities for observing and investigating how light behaves and how materials interact with light during this unit.</p> <p>Going beyond the requirements of the National Curriculum at this stage, children will have the opportunity to investigate mirrors and how light reflects from plane, concave and convex mirrors. Working scientifically, children will plan and undertake an investigation to answer the question, 'Do shadows stay the same throughout the day?'</p> <p>Planning this investigation will require children to think about the best ways to investigate things, how to make sure their investigation is fair, and how to record their findings. Children should understand that the Earth is rotating on an axis, the sun is not orbiting the earth as it may</p>	<ul style="list-style-type: none"> ● Seed Dispersal <p>This unit builds on directly from Year 2 Plants where pupils learned how to observe and describe seeds and bulbs, found out what plants need to grow and also learned how plants are grown by farmers as crops for people to eat. In this unit, pupils will look more closely at flowering plants, their features and the functions of their features. They will look at specific species including hydrangea and cacti and there is scope for including flowering plants that grow in the local area if relevant. Pupils will learn that the scientific study of plants is called botany and that what we understand about plants comes from contributions from many botanists over the years (disciplinary knowledge). In the first lesson, children will learn about Joseph Banks, the famous botanist who gathered over 30,000 plant specimens on his travels around the world with Captain Cook (pupils will learn about Captain Cook in Year 5 Geography when they Study Australia and New Zealand) and Agnes Arber, who was one of the first women to be recognised for her contribution to botany. The reason we have started this unit with looking at botanists, is to show children real scientists study plants, they look closely at plant specimens, draw and annotate pictures and diagrams, go into the world to look for plants and vitally ask questions about how plants</p>	<p>This unit introduces key knowledge of rocks including their appearance and simple physical properties. It introduces key substantive knowledge, particularly recognising different types of rock. The unit also introduces disciplinary geology knowledge and how geologists work to find out more about rocks on earth and beyond. Pupils will learn that a geologist is a scientist who studies rocks and will be introduced to some of the things that geologists might study, such as properties of rocks, composition of rocks, and what rocks can tell us about life on earth long ago. When learning about how sedimentary rock forms, children will learn that fossils form when things that have lived are trapped within rock and how this process allows us to learn about plants and animals from thousands and millions of years ago. Within this unit there is an opportunity to study soil closely and to recognise that soils are made from rocks and organic matter (decaying things that have lived). In the first lesson of this unit, pupils are introduced to rocks, linking their knowledge from History of the Stone Age and how rocks were used as tools by early humans. Pupils will learn that rocks can be very different and are asked to look closely at some rock samples, noticing the different properties rocks have. They will be introduced to the idea that rocks contain different</p>	<p>magnets</p> <p>This unit introduces pupils to simple forces, including magnetism. In Year 2, pupils began learning about magnets in the unit 'Materials and Magnets'. They began to learn that magnets attract certain metals, but that not all materials are attracted to magnets. This unit will build substantive science knowledge about how forces, such as gravity and magnetism behave. In this unit, pupils will be introduced to forces and will firstly learn about gravity and friction. They will begin to understand the concept that scientists draw conclusions about things they cannot see, like forces, from looking at the effects they have. For example, we cannot see gravity, but we can see a ball fall to the ground when we drop it. Pupils will learn that Sir Isaac Newton was a scientist who thought about why things fall when dropped and developed lots of ideas about the force of gravity. This will help pupils to develop their disciplinary knowledge, considering how scientists observe and reflect on what they notice before suggesting theories. In the second lesson, pupils will learn about the force of friction. They will compare how things move on different surfaces by investigating how a toy car moves down a ramp. They will select different materials to place on the ramp to see how it affects the car's ability to move down the ramp. They will learn that friction</p>
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		<p>flowering plants and will explore the part that flowers play in the reproduction of flowering plants. This knowledge will be revisited in more detail in a later Year 3 unit studying plants.</p>	<p>appear from the sun seeming to move across our sky. Children will understand that the sun's position in our sky determines the shape and size of our shadows. Children will see a time-lapse video of a sundial and will learn that this way of measuring time was used thousands of years ago. (Links to Ancient Greece in History) To assess their understanding, there are two options at the end of this unit. The first option requires children to draw a scientific diagram to show how shadows are made before providing a short written explanation. The second is an extended piece of writing, or essay, that answers the question 'Why is light important?' Drawing scientific diagrams and organising writing to explain something will help children to understand how scientists work and communicate their thinking. Alongside the link to History with sundials, this unit also links to Visual Arts in Year 4 where children look at how artists represent shadows in their work.</p>	<p>behave, for example how they reproduce. Therefore, when pupils go on to do some of these things in the subsequent lessons within this unit, they will understand that these tasks require scientific thinking, questioning, exploring and analysing. As pupils work through this unit they will continue to build an understanding of the diversity of life on Earth. This conceptual understanding is a thread woven throughout the units on plants in KS1 and KS2. In this unit, pupils will learn that although plants all need light and water to thrive, they need it in differing amounts. They will recognise that plants grow in diverse environments around the world and even within a garden, there are some plants better suited to particular places than others. Pupils will go on to focus on how plants transport water from their roots to the rest of the plant. They will see how celery does this by investigating what happens when we place a stick of celery in brightly coloured inky water. This builds on their understanding of what a plant needs from Year 2. This unit also covers pollination and seed dispersal, two vital parts of the life cycle of a plant. There is an emphasis on interconnection in these lessons, pupils learn how animals such as bees are vital for the pollination process and also, in some instances, for seed dispersal. When learning about pollination, there is an opportunity to show pupils pollen within a flower,</p>	<p>'ingredients', different combinations of minerals. Pupils can use a microscope, or a magnifying glass to look at the rocks, discussing what they see. The unit then progresses on to studying the three groups that geologists sort rocks into; sedimentary, igneous and metamorphic. Studying the ways in which rocks can form helps pupils to recognise the difference between rocks, the properties they have and to further understand the landscapes on earth. One of the properties pupils will study closely is permeability. They will recognise that understanding the permeability of a particular rock is useful for geologists to make decisions about what that rock should be used for. This thinking draws on understanding from Year 1 and 2 Materials, where pupils considered the properties of materials and their purpose. For example, slate is a fine grained, metamorphic rock that does not allow water to pass through it, so it is often used for roof tiles. Building on their knowledge of sedimentary rock, pupils will learn that due to the process of its formation, fossils are most often found in sedimentary rock layers. Pupils will learn that palaeontologists are scientists who study fossils. They will be introduced to the process of fossilisation and will understand that fossils are a record of things that lived on earth many thousands or millions of years</p>	<p>is a contact force, where two objects touch, but gravity is a non-contact force as it can act upon an object alone. Moving through the unit, pupils then build on their prior knowledge of magnets from Year 2. They will observe how magnets attract or repel each other and attract some materials and not others. They will compare and group materials on the basis of whether they are attracted to a magnet and will identify magnetic materials. Pupils then learn about the poles of a magnet and will think about whether two magnets will attract or repel each other, depending on which poles are facing. In the final lesson, pupils will work scientifically to test the strength of different magnets. They will learn that generally, larger magnets are stronger than smaller magnets that are made from the same material, however this is not always the case. Pupils will learn that heating a magnet to high temperatures can weaken its magnetic force. They will then test the strength of the magnets they have in the classroom and record their findings. Finally, there are some short assessment tasks suggested and an optional extended writing task that requires pupils to explain what they know about forces and magnets.</p>
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				<p>however you must consider implications of using real flowers and pollen if pupils have allergies. Care must also be taken to prevent children touching pollen with bare hands, or getting pollen near their eyes, nose or mouth. Pupils will learn that germination is the process where a seed begins to grow into a plant, building on knowledge from Year 1 and 2. Included in this unit is an additional lesson on the American botanist George Washington Carver. Understanding Carver's work will build on knowledge of food and farming from Year 2 and will show children how the work of scientists can influence how people work, what they grow and how they feed their families. Carver was born into slavery; understanding the implications of this for his life will provide some prior knowledge for children when they study the Slave Trade in Year 5. This unit plays a crucial role in helping pupils to understand substantive science knowledge, how plants grow, what they need to thrive, how they reproduce, but also disciplinary knowledge of how scientists construct knowledge within their fields.</p>	<p>ago. They will look closely, where possible, at fossil samples, or images of fossils including those of plants. Finally, pupils will build on their understanding of different rock types and will look closely at the composition of different soils. Ideally with real samples, children will use microscopes and magnifying glasses to look at soil and find out what it is made from. They will learn that scientists use the term 'organic matter' to mean a substance made up of decaying plants, animals and insects. Noticing any small rocks within the soil sample, the pupils will be able to describe the samples and compare them, recognising that like rocks, soils can be different. Finally, pupils will complete an essay (extended piece of writing) to answer this question: What can rocks tell a geologist about our planet? This will give pupils an opportunity to reflect on each lesson of this unit and create a piece of coherent scientific writing that may include labelled diagrams.</p>	
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