

Year Six



During Year 6 children develop the skills of working scientifically through 3 units:

Year	Questioning & Enquiry	Observing and Measuring	Investigating	Recording & Reporting Findings	Identifying & classifying	Conclusions	Key Vocab
6	Select the most appropriate ways to answer science questions using different types of scientific enquiry (e.g. observing over time, noticing patterns, grouping or classifying, comparative/fair testing, using secondary sources).	<p>Make own decisions about what observations to make, how to make them and the most appropriate equipment to use</p> <p>Take systematic and accurate measurements accurate to the nearest unit using a range of different units (mass, time, weight, area) and repeating reading where appropriate</p>	<p>Use test results to make predictions and to shape further enquiries</p> <p>To identify when a control is needed within an investigation and how this can be achieved.</p>	Decide how to record data from a choice of familiar approaches and how best to present the data.	Develop own keys and other information records to identify, classify and describe living things and materials.	<p>Draw conclusions based on their data, justifying ideas and using scientific knowledge and understanding to explain their findings.</p> <p>Identify evidence that refutes or supports their ideas.</p> <p>Raise further questions that could be investigated based on data and observations</p>	<p>Variable</p> <p>Accuracy</p> <p>Precise</p> <p>Repeat readings</p> <p>Scientific diagram</p> <p>Classification key</p> <p>Scatter graph</p> <p>Line graph</p> <p>Causal relationship</p> <p>Explanation</p> <p>Support</p> <p>Refute</p> <p>Pattern</p> <p>Quantitative measurements</p>
Connections to Mathematics Units (Year 6)				<p>Interpret and analyse line graphs, bar charts, pictograms and a range of tables</p> <p>Interpret and construct pie charts (using work on angles, fractions and</p>			

				percentages) and line graphs and use these to solve problems			
				Calculate and interpret the mean as an average, recognising when it is appropriate to do so			

Unit 1 (Autumn Term): Light

Connections to other science units:

This is the second unit children encounter which is in **Year 2 (light)**

Future learning:

- The similarities and differences between light waves and waves in matter. (KS3)
- Light waves travelling through a vacuum; speed of light. (KS3)
- The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. (KS3)
- Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. (KS3)
- Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. (KS3)
- Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. (KS3)

Unit	Curriculum objectives	Assessment	Key vocabulary	Ideas
Light (Physics) Year Six	<p>How light travels</p> <p>>recognise that light appears to travel in straight lines</p> <p>>use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye</p> <p>The Eye</p> <p>>explain that we see things because light travels from light sources to our eyes or from light sources to objects</p>	<p>I can use the vocabulary linked to light</p> <p>I know that light appears to travel in straight lines</p> <p>I can explain how we see things</p> <p>I understand and can explain why shadows have the same shape as their object</p>	<p>Light</p> <p>Dark</p> <p>Light source</p> <p>Object</p> <p>Sun</p> <p>Reflection</p> <p>Mirror</p> <p>Reflective</p> <p>Protect</p> <p>Shadow</p> <p>Opaque</p> <p>Translucent</p> <p>Transparent</p> <p>Filter</p> <p>Vision</p> <p>Straight</p> <p>Direction</p> <p>Spectrum*</p>	<p>Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions.</p> <p>Pupils might work scientifically by:</p> <p>Deciding where to place rear-view mirrors on cars; designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works. They might investigate the relationship between light sources, objects and shadows by using shadow puppets. They could extend their experience of light by looking a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).</p> <p>Examples of activities:</p> <p>> Children use a ruler to draw the shape of a shadow cast by an object on a simple plan diagram. They predict and then measure the width of each shadow, and try to find what kind of set-up produces the widest shadows.</p> <p>> Children learn that a periscope is a device made from 2 angled mirrors that enables the user to see around obstacles. Using the template provided, along with 2 small mirrors, children construct their own simple periscope. They attempt to explain how it works.</p> <p>> Children learn that light rays travel in straight lines, and that mirrors can make light reflect (predict) at precise angles, depending on their own position and angle. Children look at 4 simple diagrams. They predict, and then calculate (using a ruler and protractor) the best position for a mirror, so that the viewer (a car driver) can see an object (a motorcycle headlamp). They look for patterns between different distances and angles in their diagrams.</p>

	<p>and then to our eyes</p> <p>Shadows</p> <p>>use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</p>			<p>> Children learn that light travels in straight lines and can be made to follow a path by placing mirrors in its path. Children use a simple grid and position mirrors at 45° angles to make light travel through a maze. They solve 12 increasingly difficult problems, and use a blank sheet to create their own.</p> <p>> Children learn that white light is a combination of different colours, and that these colours exist on the visible light spectrum. They learn how white light can be split up into its component colours. Children use a prism and a light source to create a rainbow effect and discuss how it is cause. They learn that a range of colours can be combined into white light. Children create a spinner, which they spin using either string or a pencil, to demonstrate this.</p> <p>>Children learn that shadows are formed when light is blocked by an opaque object, creating a pattern of light on a surface. Children investigate what happens to its shadow when an object is moved towards a light source. They predict and then measure the width of an objects shadow at different distances from the light source. Children record their information in a table and use it to create a line graph. They attempt to explain the relationship between distance and shadow width.</p>
Significant individuals	Thomas Edison – tremendous influence upon modern life. He contributed to inventions such as the incandescent light bulb, the phonograph and the motion picture camera.			
Common misconceptions:			<p>Some children may think:</p> <p>We see objects because light travels from our eyes to the object.</p>	
Science Rich Texts:	<p>Books which allow opportunity to explore science:</p> <ul style="list-style-type: none"> • Blackout by John Rocco • The firework maker's daughter (www.stem.org.uk/teaching-science-through-stories) 			

*Bold text is new vocabulary

Unit 2 (Spring Term): Animals, including humans

Connections to other science units:

This is the third unit children encounter which is in **Year 1, 2 and Year 5 (Living things and their habitats)**

Future learning:

- The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. (KS3)
- The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. (KS3)
- The structure and functions of the gas exchange system in humans, including adaptations to function. (KS3)
- The mechanism of breathing to move air in and out of the lungs. (KS3)
- The impact of exercise, asthma and smoking on the human gas exchange system. (KS3)
- Heredity as the process by which genetic information is transmitted from one generation to the next. (KS3)
- A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. (KS3)
- The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. (KS3)
- Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction. (KS3)

Unit	Curriculum objectives	Assessment	Key vocabulary	Ideas
Animals including humans (Biology) Year six	<p>Digestive System >describe the simple functions of the basic parts of the digestive system in humans</p> <p>Circulatory system (parts and function) >identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</p> <p>Impact of diet, exercise, drugs and lifestyle >recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</p>	<p>I know the correct names for and can identify the main body parts and systems</p> <p>I can describe how the digestive works and the functions of the different body parts</p> <p>I can describe how the circulatory system works and the functions of the different body parts</p> <p>I know that health can be affected both positively and negatively by lifestyle choices.</p> <p>Due to sexual reproduction, the offspring are not identical and vary from each other.</p>	<p>Circulation Vein Artery Heart Chamber Lungs Oxygen Pulse</p> <p>Digestion Oesophagus Stomach Intestines Liver Acid Bowel Colon</p> <p>Drug Lifestyle Alcohol Nicotine*</p>	<p>Pupils should be introduced to the main body parts associated with the digestive system, for example, mouth, tongue, teeth, oesophagus, stomach and small and large intestine and explore questions that help them to understand their special functions.</p> <p>Pupils should explore and answer questions that help them to understand how the circulatory system enables the body to function.</p> <p>Pupils should learn 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.</p> <p>Pupils might work scientifically by:</p> <p>Exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.</p> <p>Examples of activities:</p> <ul style="list-style-type: none"> > Create a role play model for the circulatory system. > Carry out a range of pulse rate investigations: <ul style="list-style-type: none"> ▪ fair test – effect of different activities on my pulse rate ▪ pattern seeking – exploring which groups of people may have higher or lower resting pulse rates

	<p>Evolution and Inheritance</p> <p>>All living things have offspring of the same kind, as features are inherited from the parents</p> <p>>Due to sexual reproduction, the offspring are not identical and vary from each other.</p> <p>>Animals have characteristics that make them suited to their environments.</p>	<p>Animals have characteristics that make them suited to their environments.</p>		<ul style="list-style-type: none"> ▪ observation over time - how long does it take my pulse rate to return to my resting pulse rate (recovery rate) ▪ pattern seeking – exploring recovery rate for different groups of people. > Research the negative effects of drugs (e.g. tobacco) and the benefits of a healthy diet and regular exercise by asking an expert or using carefully selected secondary sources. > Children learn about the different components of blood. They learn that red blood cells carry oxygen, white blood cells fight infection, platelets help to prevent bleeding, and that plasma is the medium in which these components are suspended. Children describe the functions of red blood cells, white blood cells, platelets and plasma, and create a pie chart showing the percentage of each component by volume in a typical sample of blood. > Children learn to measure their heart rate in beats per minute (bpm) by taking their radial pulse. They take and record their resting heart rate, then perform a vigorous exercise and measure their heart rate afterwards at an interval of 1 minute for 8 minutes. Children record their results in a table and transfer them to a line graph. Children interpret their results, discussing how their heart rate changed over time and why. > Children learn that smoking involves inhaling tobacco smoke which contains the active ingredient, nicotine. They learn about the many health issues associated with smoking, such as cancer, heart damage, lung damage, and reproductive damage. They learn about other negative effects such as the unpleasant smell, high cost, and effects on the skin. Children carry out a survey, using a tally chart to find out the worst side effect of smoking. They transfer their results to a bar chart and place the negative effects in order of concern. > Children learn about the many benefits of physical exercise, and identify some aerobic exercises. Children carry out a survey, identifying the most popular forms of exercise in their class or school. They record their results in a tally chart, displaying their results in a horizontal bar chart. They identify the most popular forms of exercise and suggest ways in which they can be promoted in school. >Children can identify characteristics that will make a plant or animal suited or not suited to an environment. >Can explain why the dominant colour of the peppered moth changed over a very short period of time.
<p>Common misconceptions:</p>				<p>Some children may think:</p> <ul style="list-style-type: none"> • your heart is on the left side of your chest • the heart makes blood

	<ul style="list-style-type: none"> • the blood travels in one loop from the heart to the lungs and around the body • when we exercise, our heart beats faster to work the muscles more • some blood in our bodies is blue and some blood is red • we just eat food for energy • all fat is bad for you • all dairy is good for you • protein is good for you, so you can eat as much as you want • foods only contain fat if you can see it all drugs are bad for you. • Adaption occurs during an animals lifetime. • Offspring most resemble their parents of the same sex. • All characteristics can be inherited.
<p>Science Rich Texts:</p>	<p>Books which allow opportunity to explore science:</p> <ul style="list-style-type: none"> •Pig heart Boy by Malorie Blackman • Skellig by David Almond •The Bubble Boy by Stewart Foster •The Fastest Boy in the World by Elizabeth Laird •Professor Astro Cat’s Human Body Odyssey by Dominic Walliman and Ben Newman •A Journey through the digestive system by Emily Sohn •Your breathtaking lungs and rocking respiratory system by Paul Mason

***Bold text is new vocabulary**

Unit 3 (Summer Term): Forces

Connections to other science units:

This is the second unit children encounter which is in **Year 3**.

Future learning:

- Forces as pushes or pulls, arising from the interaction between two objects. (KS3)
- Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3)
- Moment as the turning effect of a force. (KS3)
- Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3)
- Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)

Unit	Curriculum objectives	Assessment	Key vocabulary	Ideas
Forces (Physics) Year Six	<p>Gravity >explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</p> <p>Air resistance/water resistance and friction >identify the effects of air resistance, water resistance and friction, that act between moving surfaces</p> <p>Mechanisms >recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</p>	<p>I can use the key vocabulary related to forces.</p> <p>I know that gravity is a force that pulls objects towards the centre of the Earth</p> <p>I understand how ideas have developed through history about how gravity and can name key scientists linked to this (Isaac Newton)</p> <p>I can name the forces of air resistance, water resistance and friction and demonstrate and explain how they act on everyday objects</p> <p>I can identify simple mechanisms, including gears, levers and</p>	<p>Force</p> <p>Material</p> <p>Magnet</p> <p>Attract</p> <p>Repel</p> <p>Magnetic</p> <p>Non-magnetic</p> <p>Pole</p> <p>North</p> <p>South</p> <p>Object</p> <p>Gravity</p> <p>Air resistance</p> <p>Water resistance</p> <p>Friction</p> <p>Mechanism</p> <p>Lever</p> <p>Pulley</p> <p>Gear*</p>	<p>Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall.</p> <p>They should experience forces that make things begin to move, get faster or slow down. Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel.</p> <p>Pupils should explore the effects of levers, pulleys and simple machines on movement.</p> <p>Pupils might find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.</p> <p>Pupils might work scientifically by:</p> <p>Exploring falling paper cones or cup-cake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective. They might explore resistance in water by making and testing boats of different shapes. They might design and make products that use levers, pulleys, gears and/or springs and explore their effects.</p> <p>Examples of activities:</p> <p>>Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter.</p> <p>> Investigate the effects of water resistance in a range of contexts e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water.</p>

pulleys, that increase the effect of a force

- > Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats.
- > Explore how levers, pulleys and gears work.
- > Make a product that involves a lever, pulley or gear.
- > Create a timer that uses gravity to move a ball.
- > Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.
- > Children learn that a lever is a simple machine that can give a mechanical advantage. Children set up their own lever, with fulcrum, beam and load, and investigate how far from the fulcrum different forces (weights) need to be in order to balance the load. They transfer their results to a line graph and attempt to find a relationship between the force required and the distance from the fulcrum.
- > Children learn that objects fall to the Earth due to the force of gravity. They explore why people don't fall off the 'bottom' of the Earth, and why the Moon does not fall out of the sky. Children investigate the force of gravity by weighing 5 objects in grams, and then measuring the pull between them and the Earth using a force meter, measuring the force in newtons (N). They look for a relationship between their two measurements.
- > Children create their own force meter using simple classroom equipment. They use known masses to calibrate their force meter, adding a sensible scale. Children learn that a mass of 100g experiences a pull towards the Earth due to the force of gravity of approximately 1 newton. Children explain how their force meter works and why they needed to calibrate it before using it.
- > Children learn that air resistance can be put to use in devices such as parachutes. They investigate how canopy size affects a parachute's rate of descent. They construct 4 parachutes with different canopy areas and predict and then measure how long they take to descend from a given height. They take each measurement 3 times and calculate the mean. Children show their results in a bar chart and attempt to answer the scientific question.
- > Children learn that friction is a force that prevents objects from sliding past each other easily when they are in contact with each other. Children investigate the best surface to place on a floor to prevent people from slipping. They predict and then measure the force required to make a shoe containing a weight slide across a range of surfaces. They present their results in a bar chart and attempt to answer the scientific question.
- > Children learn that a pulley is a simple machine that can be used to change the direction of a force, and can also be used to reduce the force required to lift a load. Children construct a simple pulley from 2 karabiner clips. They use a force meter to compare the force required to lift loads with and without the

				pulley. They record their results in a table and then transfer their results to a line graph showing two lines. They compare both sets of results and explain the advantage that a pulley provides.
Significant individuals	Isaac Newton – famous for his theory about gravity Galileo – studied speed and velocity, gravity and free fall. Albert Einstein – famous for his theory of relativity – gravity, space and time			
Common misconceptions:			Some children may think: <ul style="list-style-type: none"> • the heavier the object the faster it falls, because it has more gravity acting on it • forces always act in pairs which are equal and opposite • smooth surfaces have no friction • objects always travel better on smooth surfaces • a moving object has a force which is pushing it forwards and it stops when the pushing force wears out • a non-moving object has no forces acting on it • heavy objects sink and light objects float. 	
Science Rich Texts:	Books which allow opportunity to explore science: <ul style="list-style-type: none"> •The Tin Snail (www.stem.org.uk/teaching-science-through-stories) •The Enormous Turnip by Katie Daynes •Leonardo’s Dream, Hans de Beer •The Aerodynamics of Biscuits by Clare Helen Welsh Simple machines <ul style="list-style-type: none"> •Until I met Dudley •Marvellous Machines by Jane Wilsher and Andres Lozano •Lighthouse keeper’s lunch – see www.ogdentrust.com/about-us/news/partnership-science-fair 			

*Bold text is new vocabulary