






Year 5 - Animals, including humans

<p><b>National Curriculum objectives</b></p> <ul style="list-style-type: none"> <li>describe the changes as humans develop to old age.</li> </ul>	<p><b>Sticky knowledge</b></p> <ul style="list-style-type: none"> <li>Different animals mature at different rates and live to different ages.</li> <li>Puberty is something we all go through, a process which prepares our bodies for being adults, and reproduction</li> <li>Hormones control these changes, which can be physical and/or emotional.</li> </ul>	<p><b>Vocabulary</b></p> <p>Foetus, Embryo, Womb, Gestation, Baby, Toddler, Teenager, Elderly, Growth, Development, Puberty, Hormone, Physical, Emotional,</p> <p>Puberty - the vocabulary to describe sexual characteristics</p>		
<p><b>Notes and guidance</b></p> <ul style="list-style-type: none"> <li>draw a timeline to indicate stages in the growth and development of humans.</li> <li>learn about the changes experienced in puberty.</li> </ul>	<p>When babies are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn many skills. At puberty, a child's body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce. This needs to be taught alongside PSHE. The new statutory requirements for relationships and health education can be found below:</p> <ul style="list-style-type: none"> <li>statutory guidance on Physical health and mental wellbeing (primary and secondary). h</li> </ul> <p>Other useful guidance includes:</p> <ul style="list-style-type: none"> <li>Joint briefing on teaching about puberty in KS2 from PHSE Association and Association for Science Education</li> <li>Briefing on humans development and reproduction in the Primary Curriculum from PHSE Association and Association for Science Education.</li> </ul>		<p><b>Key scientists</b></p> <p><b>Thomas Young</b> (Wave Theory of Light)</p> <p><b>Ibn al-Haytham (Alhazen)</b> (Light and our Eyes)</p>	<p><b>Linked texts</b></p> <p><i>Hair in Funny Places</i> (Babette Cole)</p> <p><i>Giant</i> (Kate Scott)</p> <p><i>You're Only Old Once!</i> (Dr. Seuss)</p>

<p><b>Prior Learning</b></p>	<p><b>Future learning</b></p>	<p><b>Possible misconceptions</b></p>
<ul style="list-style-type: none"> <li>Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)</li> </ul>	<p>Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)</p>	<p>Some children may think:</p> <ul style="list-style-type: none"> <li>a baby grows in a mother's tummy</li> <li>a baby is "made".</li> </ul>






Enquiry

Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
<p>Who grows the fastest, girls or boys? How does age affect a human's reaction time?</p> 	<p>Can you identify all the stages in the human life cycle?</p> 	<p>How do different animal embryos change?</p> 	<p>Are the oldest children in our school the tallest?</p> 	<p>Why do people get grey/white hair when they get older?</p> 	<p>How and why has life expectancy in the UK changed since the Middle Ages?</p>	<p>What do humans look like?</p> <ul style="list-style-type: none"> <li>Do all animal embryos look the same?</li> <li>How do humans change?</li> <li>Why do humans change?</li> <li>What causes puberty?</li> <li>What changes do we go through during puberty?</li> <li>Are there any patterns between vertebrate animals and their gestation periods?</li> </ul>
<p>Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test.</p>	<p>Regularly revisit KSI skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using</p>	<p>Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific</p>	<p>Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Begin to think even more about their planning, including identifying the variables that they cannot control and suggesting the potential impact those variables</p>	<p>Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science</p>	<p>Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language.</p>	

<p>Plan their own tests to collect data. Through fair testing learn to understand the different types of variables:</p> <ul style="list-style-type: none"> <li>• the dependent variable that they will change in their test,</li> <li>• the independent variable that they are going to measure so that they can find out how the dependent variable affects it,</li> <li>• the control variables which the children will need to keep the same so that they don't affect their results.</li> </ul> <p>Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'.</p> <p>Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent.</p> <p>Written conclusions to become increasingly sophisticated, with more focus on scientific explanations.</p> <p>Focus on their skills in evaluating their scientific enquiries.</p> <p>Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.</p>	<p>data to answer 'big questions'.</p> <p>Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things.</p> <p>Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.</p>	<p>drawings and labelling key features using scientific vocabulary.</p> <p>Look closely and record fine details using magnifying glasses and microscopes.</p> <p>Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.</p>	<p>might have on the data they collect.</p> <p>Use a data logger to collect the most accurate data they can.</p> <p>Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs.</p> <p>Use data and graphs to support their explanations when describing relationships.</p> <p>Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.</p>	<p>professionals to get their information, or ask them questions in interviews and letters</p> <p>Find more data in their research and use this to help answer questions</p> <p>Start to collect their own data through questionnaires and interviews.</p> <p>Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.</p>	<p>Explain ideas using their scientific knowledge and understanding.</p> <p>Evaluate the significance, strengths and weaknesses of different scientists' ideas.</p>	
<p><b>Linked TAPS Assessment</b></p>	<p><b>Other TAPS ideas</b></p>	<p><b>Working scientifically</b></p>				
<p><b>Growth survey</b> Can children record and present results clearly?</p>	<ul style="list-style-type: none"> <li>• Describe the changes as humans develop to old age.</li> </ul>	<ul style="list-style-type: none"> <li>• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>• taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>• recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>• using test results to make predictions to set up further comparative and fair tests</li> <li>• reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations</li> <li>• identifying scientific evidence that has been used to support or refute ideas or arguments.</li> </ul>		<ul style="list-style-type: none"> <li>• researching the gestation periods of other animals and comparing them with humans</li> <li>• finding out and recording the length and mass of a baby as it grows.</li> </ul>		
<p><b>Activities</b></p>			<p><b>Possible evidence</b></p>			
<ul style="list-style-type: none"> <li>• This unit is likely to be taught through direct instruction due to its sensitive nature, although children can carry out a research enquiry by asking an expert e.g. school nurse to provide answers to questions that have been filtered by the teacher.</li> </ul>			<ul style="list-style-type: none"> <li>• Can present information about the changes occurring during puberty as an information leaflet for other Y5 children or answers to 'problem page questions'</li> <li>• Can explain the changes that takes place in boys and girls during puberty</li> <li>• Can explain how a baby changes physically as it grows, and also what it is able to do</li> </ul>			

Year 5 - Earth and Space – Sun, Earth & Moon: What is moving and how do we know?






<p><b>National Curriculum objectives</b></p> <ul style="list-style-type: none"> <li>Describe the movement of the Earth, and other planets, relative to the Sun in the solar system</li> <li>Describe the movement of the Moon relative to the Earth</li> <li>Describe the Sun, Earth and Moon as approximately spherical bodies</li> <li>Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.</li> </ul>	<p><b>Sticky knowledge</b></p> <ul style="list-style-type: none"> <li>Stars, planets and moons have so much mass they attract other things, including each other due to a force called gravity. Gravity works over distance.</li> <li>Objects with larger masses exert bigger gravitational forces.</li> <li>Objects like planets, moons and stars spin.</li> <li>Smaller mass objects like planets orbit large mass objects like stars.</li> <li>Stars produce vast amounts of heat and light.</li> <li>All other objects are lumps of rock, metal or ice and can be seen because they reflect the light of stars.</li> </ul>	<p><b>Vocabulary</b></p> <p>Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets</p> <p>Axis, Rotation, Day, Night, Phases of the Moon, constellation, waxing, waning, crescent, gibbous, planets, orbit, axis, spherical, geocentric, heliocentric.</p>	
<p><b>Notes and guidance</b></p> <ul style="list-style-type: none"> <li>be introduced to a model of the Sun and Earth that enables them to explain day and night.</li> <li>learn that the Sun is a star at the centre of our solar system and that it has eight planets.</li> <li>understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).</li> <li>Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.</li> <li>find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.</li> </ul>	<p>The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky. The Moon orbits the Earth. It takes about 28 days to complete its orbit. The Sun, Earth and Moon are approximately spherical.</p> <p style="text-align: center;"><b>CONCEPT: ENERGY</b></p>	<p><b>Key scientists</b></p> <p>Claudius Ptolemy and Nicolaus Copernicus (Heliocentric vs Geocentric Universe)</p> <p>Neil Armstrong (First man on the Moon)</p> <p>Helen Sharman (First British astronaut)</p> <p>Tim Peake (First British ESA astronaut)</p>	<p><b>Linked texts</b></p> <p>The Skies Above My Eyes (Charlotte Guillain &amp; Yuval Zommer)</p> <p>George's Secret Key to the Universe (Lucy and Stephen Hawking with Christophe Galfard)</p> <p>The Way Back Home (Oliver Jeffers)</p>
<p><b>Prior Learning</b></p>	<p><b>Future learning</b></p>	<p><b>Possible misconceptions</b></p>	
<ul style="list-style-type: none"> <li>Observe changes across the four seasons. (Y1 – Seasonal changes)</li> <li>Observe and describe weather associated with the seasons and how day length varies. (Y1 – Seasonal changes)</li> </ul>	<ul style="list-style-type: none"> <li>Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). (KS3)</li> <li>Our Sun as a star, other stars in our galaxy, other galaxies. (KS3)</li> <li>The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3)</li> <li>The light year as a unit of astronomical distance. (KS3)</li> </ul>	<ul style="list-style-type: none"> <li>Some children may think:</li> <li>the Earth is flat</li> <li>the Sun is a planet</li> <li>the Sun rotates around the Earth</li> <li>the Sun moves across the sky during the day</li> <li>the Sun rises in the morning and sets in the evening</li> <li>the Moon appears only at night</li> <li>night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.</li> </ul>	

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
<p>How does the length of daylight hours change in each season?</p> 	<p>How could you organise all the objects in the solar system into groups?</p> 	<p>Can you observe and identify all the phases in the cycle of the Moon?</p> 	<p>Is there a pattern between the size of a planet and the time it takes to travel around the Sun?</p> 	<p>What unusual objects did Jocelyn Bell Burnell discover? How do astronomers know what stars are made of? How have our ideas about the solar system changed over time?</p> 	<p>How have our ideas about the solar system changed over time? How is astronomer and planetary scientist Sara Seager changing our ideas about the universe?</p>	<p>How does temperature/size/day length/year length change as you get closer/further to the sun? How does distance from a light source affect how much light hits an object? Does having more moons result in more light hitting a planet? How could you test this? How does speed/size of a meteorite affect the size of the moon crater formed? If the moon became heavier as a result of meteorite collisions what would happen to its position relative to Earth? If the mass of the Earth is 80x that of the moon, why is the gravity at the Earth's surface only 6x greater than at the surface of the moon? Why do we have day/night/months/years/seasons? Why does day length change? Why does shadow size change over the course of a day?</p>
<p>Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables:</p> <ul style="list-style-type: none"> <li>the dependent variable that they will change in their test,</li> <li>the independent variable that they are going to measure so that they can find out how the dependent variable affects it,</li> <li>the control variables which the children will need to keep the same so that they don't affect their results.</li> </ul> <p>Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.</p>	<p>Regularly revisit KSI skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.</p>	<p>Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes. Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.</p>	<p>Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Begin to think even more about their planning, including identifying the variables that they cannot control and suggesting the potential impact those variables might have on the data they collect. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.</p>	<p>Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.</p>	<p>Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.</p>	

Linked TAPS Assessment	Other assessment ideas	Working scientifically	
<ul style="list-style-type: none"> <li>• Craters</li> <li>• Can children design simple tables to record results?</li> <li>• Can children present results as a bar chart or line graph?</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the movement of the Earth in relation to the Sun.</li> </ul>	<ul style="list-style-type: none"> <li>• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>• taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>• recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>• using test results to make predictions to set up further comparative and fair tests</li> <li>• reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations</li> <li>• identifying scientific evidence that has been used to support or refute ideas or arguments.</li> </ul>	<ul style="list-style-type: none"> <li>• comparing the time of day at different places on the Earth through internet links and direct communication</li> <li>• creating simple models of the solar system</li> <li>• constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day</li> <li>• finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks.</li> </ul>
Activities		Possible evidence	
<ul style="list-style-type: none"> <li>• Use secondary sources to help create a model e.g. role play or using balls to show the movement of the Earth around the Sun and the Moon around the Earth.</li> <li>• Use secondary sources to help make a model to show why day and night occur.</li> <li>• Make first-hand observations of how shadows caused by the Sun change through the day.</li> <li>• Make a sundial.</li> <li>• Research time zones.</li> <li>• Consider the views of scientists in the past and evidence used to deduce shapes and movements of the Earth, Moon and planets before space travel.</li> </ul>		<ul style="list-style-type: none"> <li>• Can use the model to explain how the Earth moves in relation to the Sun and the Moon moves in relation to the Earth</li> <li>• Can demonstrate and explain verbally how day and night occur</li> <li>• Can explain evidence gathered about the position of shadows in term of the movement of the Earth and show this using a model</li> <li>• Can explain how a sundial works</li> <li>• Can explain verbally, using a model, why we have time zones</li> <li>• Can describe the arguments and evidence used by scientists in the past</li> <li>• Can create a voice over for a video clip or animation</li> <li>• Can show, using diagrams, the movement of the Earth and Moon</li> <li>• Can explain the movement of the Earth and Moon</li> <li>• Can show using diagrams the rotation of the Earth and how this causes day and night</li> <li>• Can explain what causes day and night</li> </ul>	






Year 5 - Forces - How and Why do objects move?

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<p><b>National Curriculum objectives</b></p> <ul style="list-style-type: none"> <li>explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</li> <li>identify the effects of air resistance, water resistance and friction, that act between moving surfaces</li> <li>recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</li> </ul>	<p><b>Sticky knowledge</b></p> <ul style="list-style-type: none"> <li>Air resistance and water resistance are forces against motion caused by objects having to move air and water out of their way.</li> <li>Friction is a force against motion caused by two surfaces rubbing against each other.</li> <li>Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move</li> </ul> <p>A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall. Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object. A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines.</p>	<p><b>Vocabulary</b></p> <p>Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears, newton, force, push, pull, opposing, streamline, brake, cog, pulley.</p>				
<p><b>Notes and guidance</b></p> <ul style="list-style-type: none"> <li>Explore falling objects and raise questions about the effects of air resistance.</li> <li>Explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall.</li> <li>Experience forces that make things begin to move, get faster or slow down.</li> <li>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.</li> <li>Explore the effects of levers, pulleys and simple machines on movement.</li> <li>Find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.</li> </ul>		<table border="1"> <thead> <tr> <th data-bbox="2050 499 2457 562">Key scientists</th> <th data-bbox="2457 499 2849 562">Linked texts</th> </tr> </thead> <tbody> <tr> <td data-bbox="2050 562 2457 1077">                     Galileo Galilei (Gravity and Acceleration)                      Isaac Newton (Gravitation)                      Archimedes of Syracuse (Levers)                      John Walker (The Match)                 </td> <td data-bbox="2457 562 2849 1077">                     The Enormous Turnip (Katie Daynes)                      Leonardo's Dream (Hans de Beer)                      The Aerodynamics of Biscuits (Clare Helen Welsh)                 </td> </tr> </tbody> </table>	Key scientists	Linked texts	Galileo Galilei (Gravity and Acceleration) Isaac Newton (Gravitation) Archimedes of Syracuse (Levers) John Walker (The Match)	The Enormous Turnip (Katie Daynes) Leonardo's Dream (Hans de Beer) The Aerodynamics of Biscuits (Clare Helen Welsh)
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Prior Learning	Future learning	Possible misconceptions				
<ul style="list-style-type: none"> <li>Compare how things move on different surfaces. (Y3 - Forces and magnets)</li> <li>Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets)</li> <li>Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets)</li> <li>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. (Y3 - Forces and magnets)</li> <li>Describe magnets as having two poles. (Y3 - Forces and magnets)</li> <li>Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets)</li> </ul>	<ul style="list-style-type: none"> <li>Forces as pushes or pulls, arising from the interaction between two objects. (KS3)</li> <li>Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3)</li> <li>Moment as the turning effect of a force. (KS3)</li> <li>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)</li> <li>Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)</li> </ul>	<ul style="list-style-type: none"> <li>the heavier the object the faster it falls, because it has more gravity acting on it</li> <li>forces always act in pairs which are equal and opposite</li> <li>smooth surfaces have no friction</li> <li>objects always travel better on smooth surfaces</li> <li>a moving object has a force which is pushing it forwards and it stops when the pushing force wears out</li> <li>a non-moving object has no forces acting on it</li> <li>heavy objects sink and light objects float.</li> </ul>				

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Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
<p>How does the angle of launch affect how far a paper rocket will go? How does the surface area of an object affect the time it takes to sink?</p> 	<p>Can you label and name all the forces acting on the objects in each of these situations?</p> 	<p>How long does a pendulum swing for before it stops?</p> 	<p>Do all objects fall through water in the same way? How does surface area of parachute affect the time it takes to fall?</p> 	<p>How do submarines sink if they are full of air?</p> 	<p>How have our ideas about gravity changed over time?</p>	<ul style="list-style-type: none"> <li>• What is a force?</li> <li>• How can a force act on an object?</li> <li>• How can we see forces?</li> <li>• How can we measure forces?</li> <li>• How does the saltiness (salinity) of water affect the water resistance?</li> <li>• How does the length of a piece of a paper helicopter's wings affect the time it takes to fall?</li> <li>• How does the changing the shape of a piece of plasticine affect water resistance?</li> <li>• How does adding holes to a parachute affect the time it takes to fall?</li> <li>• How does the amount/depth of tread affect the friction between a shoe and a surface?</li> <li>• How can we use levers to lift heavy objects?</li> <li>• What is the most effective way to move an object?</li> <li>• How do see-saws work?</li> <li>• Can you create a pulley system to lift a given load?</li> </ul>
<p>Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables:</p> <ul style="list-style-type: none"> <li>• the dependent variable that they will change in their test,</li> <li>• the independent variable that they are going to measure so that they can find out how the dependent variable affects it,</li> <li>• the control variables which the children will need to keep the same so that they don't affect their results.</li> </ul> <p>Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.</p>	<p>Regularly revisit KSI skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year.</p> <p>Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.</p>	<p>Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes. Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.</p>	<p>Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Begin to think even more about their planning, including identifying the variables that they cannot control and suggesting the potential impact those variables might have on the data they collect. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.</p>	<p>Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.</p>	<p>Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.</p>	

Linked TAPS Assessment	Other assessment ideas	Working scientifically	
<p><b>Spinners</b></p> <ul style="list-style-type: none"> <li>• Can children improve accuracy by repeating measurements?</li> <li>• Can children identify patterns in results?</li> </ul> <p><b>Aqua dynamics</b></p> <ul style="list-style-type: none"> <li>• Can children use test results to make predictions relating water resistance to surface area?</li> <li>• Can children identify variables which may affect the results?</li> </ul>	<ul style="list-style-type: none"> <li>• Identify the effects of water resistance.</li> <li>• Identify the effects of air resistance.</li> </ul>	<ul style="list-style-type: none"> <li>• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>• taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>• recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>• using test results to make predictions to set up further comparative and fair tests</li> <li>• reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations</li> <li>• identifying scientific evidence that has been used to support or refute ideas or arguments.</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• explore resistance in water by making and testing boats of different shapes.</li> <li>• design and make products that use levers, pulleys, gears and/or springs and explore their effects.</li> </ul>
Activities		Possible evidence	
<ul style="list-style-type: none"> <li>• Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter.</li> <li>• 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.</li> <li>• Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats.</li> <li>• Explore how levers, pulleys and gears work.</li> <li>• Make a product that involves a lever, pulley or gear.</li> <li>• Create a timer that uses gravity to move a ball.</li> <li>• Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.</li> </ul>		<ul style="list-style-type: none"> <li>• Can demonstrate the effect of gravity acting on an unsupported object</li> <li>• Can give examples of friction, water resistance and air resistance</li> <li>• Can give examples of when it is beneficial to have high or low friction, water resistance and air resistance</li> <li>• Can demonstrate how pulleys, levers and gears work</li> <li>• Can explain the results of their investigations in terms of the force, showing a good understanding that as the object tries to move through the water or air or across the surface the particles in the water, air or on the surface slow it down</li> <li>• Can demonstrate clearly the effects of using levers, pulleys and gears</li> </ul>	






Year 5 - living things and their habitats								
<p><b>National Curriculum objectives</b></p> <ul style="list-style-type: none"> <li>describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</li> <li>describe the life process of reproduction in some plants and animals</li> </ul>	<p><b>Sticky knowledge</b></p> <ul style="list-style-type: none"> <li>Different animals mature at different rates and live to different ages.</li> <li>Some organisms reproduce sexually where offspring inherit information from both parents.</li> <li>Some organisms reproduce asexually by making a copy of a single parent.</li> <li>Environmental change can affect how well an organism is suited to its environment.</li> <li>Different types of organisms have different lifecycles.</li> </ul>	<p><b>Vocabulary</b></p> <p>Life cycle, reproduce, sexual, sperm, fertilisation, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings, pollination, dispersal, cell, pollination, male, female, pregnancy, mammal, amphibian, insect, embryo, bird, plant</p>						
<p><b>Notes and guidance</b></p> <ul style="list-style-type: none"> <li>Pupils should study and raise questions about their local environment throughout the year. They should observe life-cycle changes in a variety of living things, for example, plants in the vegetable garden or flower border, and animals in the local environment. They should find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall.</li> <li>Pupils should find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals.</li> <li>Pupils might work scientifically by: observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences. They might try to grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers, bulbs. They might observe changes in an animal over a period of time (for example, by hatching and rearing chicks), comparing how different animals reproduce and grow.</li> </ul>	<p>As part of their life cycle, plants and animals reproduce. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis. Plants reproduce both sexually and asexually. Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction which involves only one parent. Gardeners may force plants to reproduce asexually by taking cuttings. Sexual reproduction occurs through pollination, usually involving wind or insects.</p>	<table border="1"> <thead> <tr> <th data-bbox="2065 407 2457 459">Key scientists</th> <th data-bbox="2457 407 2858 459">Linked texts</th> </tr> </thead> <tbody> <tr> <td data-bbox="2065 470 2457 638"> <p><b>David Attenborough</b> (Naturalist and Nature Documentary Broadcaster)</p> </td> <td data-bbox="2457 470 2858 638"> <p>The Land of Neverbelieve (Norman Messenger)</p> </td> </tr> <tr> <td data-bbox="2065 648 2457 764"> <p><b>James Brodie of Brodie</b> (Reproduction of Plants by Spores)</p> </td> <td data-bbox="2457 648 2858 764"> <p>Mummy Laid an Egg (Babette Cole)</p> </td> </tr> </tbody> </table>	Key scientists	Linked texts	<p><b>David Attenborough</b> (Naturalist and Nature Documentary Broadcaster)</p>	<p>The Land of Neverbelieve (Norman Messenger)</p>	<p><b>James Brodie of Brodie</b> (Reproduction of Plants by Spores)</p>	<p>Mummy Laid an Egg (Babette Cole)</p>
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<p><b>Prior Learning</b></p>	<p><b>Future learning</b></p>	<p><b>Possible misconceptions</b></p>						
<ul style="list-style-type: none"> <li>Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)</li> <li>Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)</li> <li>recognise that living things can be grouped in a variety of ways (Y4)</li> <li>explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment (Y4)</li> <li>recognise that environments can change and that this can sometimes pose dangers to living things (Y4)</li> </ul>	<ul style="list-style-type: none"> <li>describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals (Y6)</li> <li>give reasons for classifying plants and animals based on specific characteristics (Y6)</li> <li>Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)</li> <li>Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)</li> </ul>	<p>Some children may think:</p> <ul style="list-style-type: none"> <li>all plants start out as seeds</li> <li>all plants have flowers</li> <li>plants that grow from bulbs do not have seeds</li> <li>only birds lay eggs.</li> </ul>						

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
<p>How does the level of salt affect how quickly brine shrimp hatch?</p> 	<p>Compare this collection of animals based on similarities and differences in their lifecycle.</p> 	<p>How does a bean change as it germinates?</p> 	<p>Is there a relationship between a mammal's size and its gestation period?</p> 	<p>What are the differences between the life cycle of an insect and a mammal?</p> 	<p>How did the experiments and ideas of Jan Ingenhousz help improve our understanding of plants?</p>	<p>What is a life cycle?            What types of life cycles are there?            Are life cycles the same?            Do plants reproduce in the same ways as us?            How do plants spread their seeds?</p>
<p>Use an increasingly wide range of equipment to make measurements.            Learn what it means to measure accurately and check for reliability.            Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question'            Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test.            Plan their own tests to collect data.            Through fair testing learn to understand the different types of variables:</p> <ul style="list-style-type: none"> <li>• the dependent variable that they will change in their test,</li> <li>• the independent variable that they are going to measure so that they can find out how the dependent variable affects it,</li> <li>• the control variables which the children will need to keep the same so that they don't affect their results.</li> </ul> <p>Measure and record data that can then be displayed in a scatter graph or line graph.            Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'.            Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent.            Written conclusions to become increasingly sophisticated, with more focus on scientific explanations.            Focus on their skills in evaluating their scientific enquiries.            Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.</p>	<p>Regularly revisit KSI skills: Focus on asking questions about the similarities and differences between things.            Go outside to explore the world around them at all times of the year.</p> <p>Increased focus on measuring and using data to answer 'big questions'.            Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things.            Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.</p>	<p>Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels.            Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary.            Look closely and record fine details using magnifying glasses and microscopes.            Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.</p>	<p>Begin to think for themselves when deciding what they should measure and observe.            Begin to make decisions about the most appropriate equipment to use to collect data.            Begin to think even more about their planning, including identifying the variables that they cannot control and suggesting the potential impact those variables might have on the data they collect.            Use a data logger to collect the most accurate data they can.            Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs.            Use data and graphs to support their explanations when describing relationships.            Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.</p>	<p>Reading for information and note-taking.            Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'.            Use a range of secondary sources, including books, websites, and video to find their information.            Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters            Find more data in their research and use this to help answer questions            Start to collect their own data through questionnaires and interviews.            Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.</p>	<p>Explore and talk about their own and other people's scientific ideas.            Begin to recognise how scientific ideas change and develop over time.            Use a range of secondary sources of information.            Develop their use of scientific language.            Explain ideas using their scientific knowledge and understanding.            Evaluate the significance, strengths and weaknesses of different scientists' ideas.</p>	

Linked TAPS Assessment	Other linked TAPS	Working scientifically	
<p><b>Life cycle research</b></p> <ul style="list-style-type: none"> <li>• Can children present their research clearly?</li> <li>• Can children present using scientific language?</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.</li> <li>• Describe the life process of reproduction in some plants and animals.</li> </ul>	<ul style="list-style-type: none"> <li>• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>• taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>• recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>• using test results to make predictions to set up further comparative and fair tests</li> <li>• reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations</li> <li>• identifying scientific evidence that has been used to support or refute ideas or arguments.</li> </ul>	<ul style="list-style-type: none"> <li>• observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences.</li> <li>• try to grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers, bulbs.</li> <li>• observe changes in an animal over a period of time (for example, by hatching and rearing chicks), comparing how different animals reproduce and grow.</li> </ul>
<b>Activities</b>		<b>Possible evidence</b>	
<ul style="list-style-type: none"> <li>• Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals.</li> <li>• Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth.</li> <li>• Look for patterns between the size of an animal and its expected life span.</li> <li>• Grow and observe plants that reproduce asexually e.g. strawberries, spider plants, potatoes.</li> <li>• Take cuttings from a range of plants e.g. African violet, mint.</li> <li>• Plant bulbs and then harvest to see how they multiply.</li> <li>• Use secondary sources to find out about pollination.</li> </ul>		<ul style="list-style-type: none"> <li>• Can draw the life cycle of a range of animals identifying similarities and differences between the life cycles</li> <li>• Can explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways</li> <li>• Can present their understanding of the life cycle of a range of animals in different ways e.g. drama, pictorially, chronological reports, creating a game</li> <li>• Can identify patterns in life cycles</li> <li>• Can compare two or more animal life cycles they have studied</li> <li>• Can explain how a range of plants reproduce asexually</li> </ul>	

**Year 5 - Properties and changes in materials (Mixtures and separation / Changes)**

National Curriculum objectives			Sticky knowledge			Vocabulary			
<ul style="list-style-type: none"> <li>compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets</li> <li>know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</li> <li>use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</li> <li>give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</li> <li>demonstrate that dissolving, mixing and changes of state are reversible changes</li> <li>explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</li> </ul>			<ul style="list-style-type: none"> <li>When two or more substances are mixed and remain present the mixture can be separated.</li> <li>Some changes can be reversed, and some cannot.</li> <li>Materials change state by heating and cooling.</li> <li>All matter (including gas) has mass.</li> <li>Sometimes mixed substances react to make a new substance. These changes are usually irreversible.</li> <li>Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible.</li> <li>Indicators that something new has been made are: The properties of the material are different (colour, state, texture, hardness, smell, temperature)</li> <li>If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change)</li> </ul>			<p>Thermal/electrical insulator/conductor, Hardness, transparency, conductivity, magnetic, transparent, flexible, permeable, magnetic, hard, change of state, mixture, dissolve, solution, solubility, soluble, insoluble, filter, sieve, reversible/irreversible change, chemical, physical, separate, mixture, suspension, burning, rusting, new material</p> <p>Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection</p>			
<p align="center"><b>Notes and guidance</b></p> <ul style="list-style-type: none"> <li>exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism (Y3) and electricity (Y4).</li> <li>explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.</li> <li>explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda.</li> <li>find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.</li> <li><i>Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. Safety guidelines should be followed when burning materials.</i></li> </ul>			<p>Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. Mixtures can be separated by filtering, sieving and evaporation. Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.</p>			<p align="center"><b>Key scientists</b></p> <p><b>Spencer Silver, Arthur Fry and Alan Amron</b> (Post-It Notes)</p> <p><b>Ruth Benerito</b> (Wrinkle-Free Cotton)</p>		<p align="center"><b>Linked texts</b></p> <p><b>Itch</b> (Simon Mayo)</p> <p><b>Kensuke's Kingdom</b> (Michael Morpurgo)</p> <p><b>The BFG</b> (Roald Dahl)</p>	
Prior Learning			Future learning			Possible misconceptions			
<ul style="list-style-type: none"> <li>Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials)</li> <li>Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)</li> <li>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. (Y3 - Forces and magnets)</li> <li>Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter)</li> <li>Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). (Y4 - States of matter)</li> <li>Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter)</li> </ul>			<p>Chemical reactions as the rearrangement of atoms. (KS3)</p> <ul style="list-style-type: none"> <li>Representing chemical reactions using formulae and using equations. (KS3)</li> <li>Combustion, thermal decomposition, oxidation and displacement reactions. (KS3)</li> <li>Defining acids and alkalis in terms of neutralisation reactions. (KS3)</li> <li>The pH scale for measuring acidity/alkalinity, and indicators. (KS3)</li> </ul>			<p>Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed. Some children may think:</p> <ul style="list-style-type: none"> <li>thermal insulators keep cold in or out</li> <li>thermal insulators warm things up</li> <li>solids dissolved in liquids have vanished and so you cannot get them back</li> <li>lit candles only melt, which is a reversible change.</li> </ul>			

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
<p>Which type of sugar dissolves the fastest? Which shoe is the most slippery?</p> <p>How does the temperature of tea affect how long it takes for a sugar cube to dissolve? Which material rusts fastest/slowest? How can we change the 'jellyness' of jelly?</p> 	<p>Can you group these materials based on whether they are transparent or not? Can you identify and classify these reactions and changes into reversible, and irreversible? Can you describe their groups' similarities and differences?</p> 	<p>How does a container of saltwater change over time? How does a sugar cube change as it is put in a glass of water? How does a nail in saltwater change over time?</p> 	<p>Do all stretchy materials stretch in the same way? How does temperature affect how much solute we can dissolve? What patterns can you notice in different reactions? How does the amount of bicarbonate of soda, washing up liquid and vinegar affect the reaction?</p> 	<p>What are microplastics and why are they harming the planet? What are smart materials and how can they help us?</p> 	<p>What did Stephanie Kwolek discover and why was it important?</p>	<p>What are mixtures? What does dissolve mean? Which of the following dissolve in water: sugar, bicarbonate of soda, oil, chocolate, coffees, dark vinegar and wax? How does the amount of water used affect how much sugar will dissolve in it? Which sweets dissolve in water? How can we separate mixtures? How can we clean our dirty water?</p>
<p>Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables:</p> <ul style="list-style-type: none"> <li>the dependent variable that they will change in their test,</li> <li>the independent variable that they are going to measure so that they can find out how the dependent variable affects it,</li> <li>the control variables which the children will need to keep the same so that they don't affect their results.</li> </ul> <p>Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.</p>	<p>Regularly revisit KSI skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year.</p> <p>Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.</p>	<p>Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes. Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.</p>	<p>Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Begin to think even more about their planning, including identifying the variables that they cannot control and suggesting the potential impact those variables might have on the data they collect. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.</p>	<p>Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.</p>	<p>Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.</p>	

Linked TAPS Assessment	Other linked TAPS	Working scientifically	
<p><b>Champion tape</b></p> <ul style="list-style-type: none"> <li>Can children recommend a champion tape?</li> <li>Can children explain how they have come to their conclusion?</li> </ul> <p><b>Dissolving</b></p> <ul style="list-style-type: none"> <li>Can children plan a fair test to investigate factors affecting the speed at which solids dissolve in water?</li> </ul> <p><b>Insulation layers</b></p> <ul style="list-style-type: none"> <li>Can children carry out an investigation to test a hypothesis?</li> </ul> <p><b>Testing nappy absorbency</b></p> <ul style="list-style-type: none"> <li>Can children plan and carry out a fair test to compare the absorbency of different brand nappies?</li> <li>Can children explain why the test is/is not fair?</li> </ul> <p><b>Sugar cube snacks</b></p> <ul style="list-style-type: none"> <li>Can children record data clearly and accurately? <ul style="list-style-type: none"> <li>Can children record repeat readings?</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate that changes of state are reversible changes.</li> <li>Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.</li> <li>Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials.</li> <li>Know that some materials will dissolve in liquid to form a solution.</li> </ul>	<ul style="list-style-type: none"> <li>planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>using test results to make predictions to set up further comparative and fair tests</li> <li>reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations</li> <li>identifying scientific evidence that has been used to support or refute ideas or arguments.</li> </ul>	<ul style="list-style-type: none"> <li>carrying out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'</li> <li>compare materials in order to make a switch in a circuit.</li> <li>observe and compare the changes that take place, for example, when burning different materials or baking bread or cakes.</li> <li>research and discuss how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials.</li> </ul>
<b>Activities</b>		<b>Possible evidence</b>	
<ul style="list-style-type: none"> <li>Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat.</li> <li>Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate.</li> <li>Investigate rates of dissolving by carrying out comparative and fair test.</li> <li>Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture.</li> <li>Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning.</li> <li>Carry out comparative and fair tests involving non-reversible changes e.g. What affects the rate of rusting? What affects the amount of gas produced?</li> <li>Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton).</li> </ul>		<ul style="list-style-type: none"> <li>Can use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings</li> <li>Can explain what dissolving means, giving examples</li> <li>Can name equipment used for filtering and sieving</li> <li>Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving</li> <li>Can describe some simple reversible and non-reversible</li> <li>Can create a chart or table grouping/comparing everyday materials by different properties</li> <li>Can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose</li> <li>Can group solids based on their observations when mixing them with water</li> <li>Can give reasons for choice of equipment and methods to separate a given solution or mixture such as salt or sand in water</li> <li>Can explain the results from their investigations</li> </ul>	