



Topic name	Term	Skills developed	Link to NC subject content	Prior learning	Next link in curriculum
Energy	Autumn	<ul style="list-style-type: none"><li>• Devise questions</li><li>• Test Hypothesis</li><li>• Justify opinions</li><li>• Communicate ideas</li><li>• Collect data</li><li>• Plan variables</li></ul>	<ul style="list-style-type: none"><li>• Processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels.</li><li>• Energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change</li><li>• Comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions</li><li>• Using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes.</li></ul>	<p>Energy is not a topic studied in KS1 or KS2 and so will be a new concept for the students. Most will have heard of energy but will not have formally studied it. There are some topics in KS2 which can be used to make connections with ideas about energy and this is where the teaching needs to start.</p> <p><b>Links from KS2:</b></p> <p>Students will have learnt about light and sound and this can be linked to the idea that a brighter light or a louder sound is more energetic. From studying electric circuits they will know that increasing the number of cells or the voltage of a battery will make the light brighter or the buzzer louder. This could be used to introduce the idea that the battery provides a store of energy. In Biology they will have learnt that green plants absorb sunlight to grow. Ideas from these topics should be used to establish the concept that energy makes things change, grow or move.</p> <p><b>LIGHT P3.1</b></p> <ol style="list-style-type: none"><li>1. recognise that they need light in order to see things and that dark is the absence of light</li><li>3. recognise that light from the sun can be dangerous and that there are ways to protect their eyes</li></ol> <p><b>P4.1 SOUND</b></p>	<p>Y8 – Autumn: <i>Heating and cooling</i></p> <p>Y9 – Autumn: <i>Energy</i></p> <p>Links to GCSE Topic 1 <b>Energy</b></p> <p>Year 10: Energy Internal Energy <i>Energy resources</i></p>



				<p>1. identify how sounds are made, associating some of them with something vibrating</p> <p>4. find patterns between the volume of a sound and the strength of the vibrations that produced it</p> <p>5. recognise that sounds get fainter as the distance from the sound source increases.</p> <p><b>P6.2 Electricity</b></p> <p>1. associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</p>	
<b>Forces</b>	<b>Autumn</b>	<ul style="list-style-type: none"> <li>Collect data</li> <li>Present data</li> <li>Analyse patterns</li> <li>Draw conclusions</li> <li>Construct explanations</li> </ul>	<ul style="list-style-type: none"> <li>Forces as pushes or pulls, arising from the interaction between two objects</li> <li>Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces</li> <li>Forces measured in newtons, measurements of stretch or compression as force is changed</li> <li>Non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity.</li> <li>Speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time)</li> <li>The representation of a journey on a distance-time graph</li> </ul>	<p><b>Links from KS2:</b></p> <p><b>P3.2 FORCES and MAGNETS</b></p> <p>1. compare how things move on different surfaces</p> <p>2. notice that some forces need contact between two objects, but magnetic forces can act at a distance</p> <p><b>P5.2 FORCES</b></p> <p>1. explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</p>	<p>Y8 Summer: <i>Forces Extension</i></p> <p><b>Links to GCSE</b> topic 3 and 4:</p> <p><b>Forces</b> <b>Forces and motion</b></p> <p>Year 9: <i>Pressure</i> <i>Motion</i> <i>Vectors and forces</i> <i>Newton's laws</i></p> <p>Year 10: <i>Forces</i> <i>Elasticity</i></p>



			<ul style="list-style-type: none"> <li>• Opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface.</li> <li>• Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)</li> <li>• Change depending on direction of force and its size.</li> <li>• Gravity force, weight = mass x gravitational field strength (g), on Earth <math>g=10 \text{ N/kg}</math>, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only)</li> </ul>	<p>2. identify the effects of air resistance, water resistance and friction, that act between moving surfaces</p>	<p>Year 11: <i>Vectors, moments and levers</i> <i>Momentum</i></p>
Electricity	Spring	<ul style="list-style-type: none"> <li>• Collect data</li> <li>• Present data</li> <li>• Analyse patterns</li> <li>• Draw conclusions</li> </ul> <p>Construct explanations</p>	<ul style="list-style-type: none"> <li>• Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects</li> <li>• The idea of electric field, forces acting across the space between objects not in contact. electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge</li> <li>• Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current</li> <li>• Differences in resistance between conducting and insulating components (quantitative).</li> </ul>	<p><b>Links from KS2:</b></p> <p><b>ELECTRICITY</b></p> <p><b>P4.2</b></p> <ol style="list-style-type: none"> <li>1. identify common appliances that run on electricity</li> <li>2. construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers</li> <li>3. identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery</li> <li>4. recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit</li> </ol>	<p>Y9 Spring: Electricity</p> <p><b>Further links to KS4 topic 5 and 6:</b></p> <p>Year 10: <i>Electricity in the home</i></p> <p>Year 11: <i>Magnetism</i> <i>Electromagnetism</i></p>



				<p>5. recognise some common conductors and insulators, and associate metals with being good conductors.</p> <p><b>P6.2</b></p> <p>1. associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</p> <p>2. compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches</p> <p>3. use recognised symbols when representing a simple circuit in a diagram.</p>	
Waves	Summer	<ul style="list-style-type: none"> <li>Discuss and develop arguments</li> <li>Use real life examples as a basis for finding out about science</li> <li>Make links between other science and other subject areas of curriculum</li> <li>Research</li> <li>Experiment</li> <li>Collect data</li> <li>Plan variables</li> </ul>	<ul style="list-style-type: none"> <li>Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition.</li> <li>Frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound</li> <li>Sound needs a medium to travel, the speed of sound in air, in water, in solids</li> <li>Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal</li> <li>Auditory range of humans and animals.</li> <li>Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound; waves transferring information for conversion to electrical signals by microphone.</li> </ul>	<p><b>LIGHT P3.1</b></p> <p>1. recognise that they need light in order to see things and that dark is the absence of light</p> <p>2. notice that light is reflected from surfaces</p> <p>3. recognise that light from the sun can be dangerous and that there are ways to protect their eyes</p> <p>4. recognise that shadows are formed when the light from a light source is blocked by an opaque object</p> <p>5. find patterns in the way that the size of shadows change.</p> <p><b>LIGHT P6.1</b></p>	<p>Y9 Autumn: Waves Electromagnetic waves</p> <p><b>Further links to KS4 topic 4: waves</b></p> <p>Year 10: <i>Heating and Infrared</i></p> <p>Year 11: <i>Colour and lenses</i></p>



- The similarities and differences between light waves and waves in matter
- Light waves travelling through a vacuum; speed of light
- The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface
- 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
- Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras
- Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.

1. recognise that light appears to travel in straight lines
2. 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
3. explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes
4. use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

**P4.1 SOUND**

1. identify how sounds are made, associating some of them with something vibrating
2. recognise that vibrations from sounds travel through a medium to the ear
3. find patterns between the pitch of a sound and features of the object that produced it
4. find patterns between the volume of a sound and the strength of the vibrations that produced it
5. recognise that sounds get fainter as the distance from the sound source increases.