

# Physics: Phase 5 (Y12-13) Outcomes

<p style="text-align: center;"><b>Key Knowledge</b></p> <p><b>Pupils will know:</b></p>	<p style="text-align: center;"><b>Key Skills</b></p> <p><b>Pupils will be able to:</b></p>
<p><b>Key Threshold Concepts</b></p> <p>Complex issues relating to the nature of matter, radiation and quantum phenomena are understood through knowledge of some fundamental physical properties.</p> <p>The mastery of our world and continued human advancement relies on the principles and applications of mechanics, materials and waves.</p> <p>Experimental and investigative skills are essential tools for expanding our knowledge of the physical world. The ability to formulate hypotheses and independently investigate this is an essential skill.</p> <p><b>Subject-specific Knowledge</b></p> <ul style="list-style-type: none"> <li>- Mechanics</li> <li>- Electric circuits</li> <li>- Materials</li> <li>- Waves and the particle nature of light</li> <li>- Electric and magnetic fields</li> <li>- Nuclear and particle physics</li> <li>- Thermodynamics</li> <li>- Space</li> <li>- Nuclear radiation</li> <li>- Gravitational fields</li> <li>- Oscillations</li> </ul> <p><b>Cross –Curricular Knowledge</b></p> <ul style="list-style-type: none"> <li>• Distance – time graphs in maths</li> <li>• Rearranging equations</li> <li>• Calculating gradients of lines</li> <li>• Converting between units</li> <li>• Using standard form</li> <li>• Calculations using logs</li> </ul>	<ul style="list-style-type: none"> <li>• Use theories, models and ideas to develop and modify scientific explanations</li> <li>• Use knowledge and understanding to pose scientific questions, define scientific problems, present scientific argument and scientific ideas</li> <li>• Use appropriate methodology, including ICT, to answer scientific questions and solve scientific problems</li> <li>• Carry out experimental and investigative activities, including appropriate risk management, in a range of contexts</li> <li>• Demonstrate and apply the knowledge, understanding and skills described in the content</li> <li>• Analyse, interpret and evaluate a range of scientific information, ideas and evidence, recognising correlations and causal relationships</li> <li>• Evaluate methodology, evidence and data and resolve conflicting evidence</li> <li>• Appreciate the tentative nature of scientific knowledge</li> <li>• Communicate information and ideas in appropriate ways using appropriate terminology</li> <li>• Consider applications and implications of science and appreciate their associated benefits and risks</li> </ul> <p><b>Apply mathematical skills to physics:</b></p> <ul style="list-style-type: none"> <li>- Change the subject of an equation</li> <li>- Substitute numerical values</li> <li>- Solve algebraic equations using decimal and standard form, ratios, fractions and percentages.</li> <li>- Be familiar with Système Internationale d’Unités (SI) units and their prefixes, be able</li> </ul>

# Physics: Phase 4 (Y9 - 11) Outcomes

<b>Key Knowledge</b> <b>Pupils will know:</b>	<b>Key Skills</b> <b>Pupils will be able to:</b>
<p><b>Key Threshold Concepts</b></p> <ul style="list-style-type: none"> <li>- The use of models, as in the particle model of matter or the wave models of light and of sound.</li> <li>- The concept of cause and effect in explaining such links as those between force and acceleration, or between changes in atomic nuclei and radioactive emissions.</li> <li>- The phenomena of 'action at a distance' and the related concept of the field as the key to analysing electrical, magnetic and gravitational effects.</li> <li>- Differences, for example between pressures or temperatures or electrical potentials, are the drivers of change.</li> <li>- Proportionality, for example between weight and mass of an object or between force and extension in a spring, is an important aspect of many models in science.</li> <li>- Physical laws and models are expressed in mathematical form.</li> </ul> <p><b>Subject-specific Knowledge</b></p> <ul style="list-style-type: none"> <li>- Energy</li> <li>- Electricity</li> <li>- Particle model of matter</li> <li>- Atomic structure</li> <li>- Forces</li> <li>- Waves</li> <li>- Magnetism and electromagnetism</li> <li>- Space physics</li> </ul> <p><b>Cross –Curricular Knowledge</b></p> <ul style="list-style-type: none"> <li>- Distance, time graphs in maths</li> <li>- Rearranging equations</li> <li>- Calculating gradients of lines</li> </ul>	<p>Apply understanding:</p> <ul style="list-style-type: none"> <li>- Apply and make sense of all aspects of working scientifically in situations that might be unfamiliar (includes using observations and processing data)</li> </ul> <p>Evaluate:</p> <ul style="list-style-type: none"> <li>- Evaluate evidence, both data and literature, to draw conclusions</li> </ul> <p>Working scientifically:</p> <ul style="list-style-type: none"> <li>- Understand the development of scientific thinking</li> <li>- Use appropriate methods to conduct and evaluate practical investigations</li> <li>- Apply the cycle of collecting, presenting and analysing data</li> <li>- Use appropriate scientific vocabulary, quantities, units, symbols and nomenclature</li> </ul> <p>Apply mathematical knowledge:</p> <ul style="list-style-type: none"> <li>- Arithmetic and numerical computation</li> <li>- Data handling</li> <li>- Algebra</li> <li>- Graphs</li> <li>- Geometry and trigonometry</li> </ul>

## Zoom in on tangible processes to better understand scientific concepts

# Science: Phase 3 (Y6 - 8) Outcomes

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<b>Key Knowledge</b>	<b>Key Skills</b>
<b>Pupils will know:</b>	<b>Pupils will be able to:</b>
<p><b>Key Threshold Concepts</b></p> <ul style="list-style-type: none"> <li>- Science is about working objectively, modifying explanations to take account of new evidence and ideas and subjecting results to peer review.</li> <li>- The fundamental units of living organisms are cells, which may be part of highly adapted structures.</li> <li>- Living organisms are interdependent and show adaptations to their environment</li> <li>- Matter is composed of tiny particles called atoms</li> <li>- Elements show periodic relationships in their chemical and physical properties.</li> <li>- Physical laws and models are expressed in mathematical form.</li> </ul> <p><b>Subject-specific Knowledge</b></p> <ul style="list-style-type: none"> <li>- Structure and function of living organisms</li> <li>- Material cycles and energy</li> <li>- Interactions and interdependencies</li> <li>- Genetics and evolution</li> <li>- The particulate nature of matter</li> <li>- The periodic table</li> <li>- Pure and impure substances</li> <li>- Chemical reactions and energetics</li> <li>- Earth and atmosphere</li> <li>- Energy</li> <li>- Forces and motion</li> <li>- Waves</li> <li>- Electricity and electromagnetism</li> <li>- Space physics</li> </ul> <p><b>Cross –Curricular Knowledge</b></p> <ul style="list-style-type: none"> <li>- Rearranging equations.</li> <li>- The environmental impacts of the industrial revolution.</li> <li>- Human reproduction within PSHE</li> </ul>	<p><b>Experimental skills and investigations</b></p> <ul style="list-style-type: none"> <li>- Ask questions and develop a line of enquiry</li> <li>- Make predictions using scientific knowledge and understanding</li> <li>- Select, plan and carry out the most appropriate types of scientific enquiries to test predictions</li> <li>- Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work</li> <li>- Make and record observations and measurements using a range of methods for different investigations</li> <li>- Evaluate the reliability of methods and suggest possible improvements</li> </ul> <p><b>Analysis and evaluation</b></p> <ul style="list-style-type: none"> <li>- Present observations and data using appropriate methods</li> <li>- Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions</li> <li>- Present reasoned explanations, including explaining data in relation to predictions and hypotheses</li> <li>- Evaluate data, showing awareness of potential sources of random and systematic error</li> </ul> <p><b>Measurement</b></p> <ul style="list-style-type: none"> <li>- Use SI units and IUPAC nomenclature</li> <li>- Use and derive simple equations and carry out appropriate calculations</li> <li>- Undertake basic data analysis including simple statistical techniques</li> </ul>

## Science: Phase 2 (Y2 - 5) Outcomes

<b>Key Knowledge</b> Pupils will know:	<b>Key Skills</b> Pupils will be able to:
<b>Key Threshold Concepts</b> <ul style="list-style-type: none"><li>- Science is about working objectively, modifying explanations to take account of new evidence and ideas and subjecting results to peer review.</li><li>- Living things can be classified into broad groups based on similarities and differences.</li><li>- Everyday materials can be grouped together on the basis of their properties</li><li>- Some changes result in the formation of new materials and this is not usually reversible</li></ul>	<b>Scientific attitudes</b> <ul style="list-style-type: none"><li>- Understand the world scientifically by exploring, talking about, testing and developing ideas about everyday phenomena and the relationships functions and interactions between living things and familiar environments</li></ul>
<b>Subject-specific Knowledge</b> <ul style="list-style-type: none"><li>- Living things and their habitats</li><li>- Plants</li><li>- Animals, including humans</li><li>- Uses of everyday materials</li><li>- Rocks</li><li>- Light</li><li>- Forces and magnets</li><li>- States of matter</li><li>- Sound</li><li>- Electricity</li><li>- Properties and changes of materials</li><li>- Earth and space</li></ul>	<b>Experimental skills and investigations</b> <ul style="list-style-type: none"><li>- Ask relevant questions and use different types of scientific enquiries to answer them</li><li>- Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li><li>- Set up simple practical enquiries, comparative and fair tests</li><li>- Make systematic and careful observations</li></ul>
<b>Cross –Curricular Knowledge</b> <ul style="list-style-type: none"><li>- Human reproduction within PSHE</li><li>- Rocks and earth within geography</li></ul>	<b>Analysis and evaluation</b> <ul style="list-style-type: none"><li>- Gather, record, classify and present data of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li><li>- Report and present findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations</li><li>- Use results to draw simple conclusions, make predictions for new values, suggest improvements and set up further comparative and fair tests</li><li>- Identify differences, similarities or changes related to simple scientific ideas and processes</li><li>- Identify scientific evidence that has been used to support or refute ideas or arguments</li></ul>
	<b>Measurement</b> <ul style="list-style-type: none"><li>- Take measurements with increasing accuracy, using a range of equipment, including thermometers and data loggers</li></ul>

*The world is beautiful to look at, but even more beautiful to understand –  
Brian Cox*

Looking curiously at the world around us

## Science: Phase 1 (N - 2) Outcomes

<b>Key Knowledge</b> Pupils will know:	<b>Key Skills</b> Pupils will be able to:
<b>Key Threshold Concepts</b> <ul style="list-style-type: none"><li>- Science is about looking closely at the world around us, making observations, asking questions, and thinking about how we could find the answers.</li><li>- We can affect the things around us.</li><li>- Not every object, place, living thing, and material is the same.</li><li>- There are often explanations for the changes, events, and other observations we make of the world around us.</li><li>- If we look closely at the world around us, we can often find explanations for what we see.</li><li>- Materials have different properties and these affect what they are used for.</li><li>- Living things find what they need to stay healthy in the environment around them.</li><li>- Different living things need different things to stay healthy and survive.</li></ul> <b>Subject-specific Knowledge</b> <ul style="list-style-type: none"><li>- Living things and their habitats</li><li>- Basic structure of common plants and animals, including humans</li><li>- Properties of everyday materials</li><li>- Changes across the four seasons</li><li>- Differences between things that are living, dead, and things that have never been alive</li><li>- Simple food chains</li><li>- What animals and plants need to survive, grow, and stay healthy, and how they obtain these things</li><li>- The shapes of solids can be changed by squashing, bending, twisting and stretching</li></ul> <b>Cross-curricular Links</b> <ul style="list-style-type: none"><li>- PSHE: healthy lifestyles</li><li>- Maths: bar charts, venn diagrams, carroll diagrams,</li></ul>	<b>Scientific attitudes</b> <ul style="list-style-type: none"><li>- Know that science can help us to understand what we observe in the world around us</li><li>- Look at the world with curiosity and a desire to understand more</li></ul> <b>Experimental skills and investigations</b> <ul style="list-style-type: none"><li>- Ask relevant questions and know that they can be answered in different ways</li><li>- Make careful observations</li><li>- Perform simple tests</li><li>- Observe things carefully using simple equipment</li></ul> <b>Analysis and evaluation</b> <ul style="list-style-type: none"><li>- Identify and classify living things and materials by their basic structures or properties</li><li>- Use observations to suggest answers to questions</li><li>- Gather and record data to help answer questions</li></ul> <b>Measurement</b> <ul style="list-style-type: none"><li>- Take measurements using simple equipment</li></ul>

