

## KS4 Physics – Energy and Forces

Subject curriculum intent:	<p>To develop in our students:</p> <ul style="list-style-type: none"> <li>• An enjoyment of Science by providing relevant, interesting and challenging experiences and activities.</li> <li>• Observational skills, by looking for patterns and contrasts.</li> <li>• An inquiring mind and a logical approach to problem solving.</li> <li>• The ability to draw conclusions from simple experiments and, where appropriate, to devise suitable experiments for further investigations.</li> <li>• Communication skills in speaking and listening, written, diagrammatic and symbolic forms.</li> <li>• Co-operation and a respect for others by being able to work as part of a team – the development of appropriate social skills.</li> <li>• Confidence in their own abilities.</li> <li>• A respect for the environment and a careful use of resources.</li> <li>• An interest in the world about them and a greater understanding of it.</li> </ul>		
End of KS3 intent/outcome	End of KS4 intent/outcome	End of KS5 intent/outcome	
Students will build on their knowledge of science through the different areas – biology chemistry and physics. Students will ‘work scientifically’ to achieve the goals of each topic area they encounter.	Students will continue to develop their scientific knowledge through the different areas – biology, chemistry and physics. Students will ‘work scientifically’ to achieve the goals of each topic area they encounter. Students will be able to relate their scientific experiences to everyday life and have an understanding that science is all around them.	N/A	
Intent for this topic:	<p>Students will learn that there are types of energy and that energy can be found in many objects, most displaying more than one type of energy. They will start to be able to identify when an energy has changed from one form to another and whether the energy is useful or wasted. Students will identify how energy can be saved through investigations into heat loss and insulation. Some students will start to calculate speed and power or work done. All students will learn that forces are pushes or pulls and that forces cause objects to move. They will also learn about friction and how this effects the movement of an object.</p> <p>Students will ‘work scientifically’ to achieve these goals, learning the key features of scientific enquiry; observing over time, pattern seeking, identifying, classifying, investigating (fair tests) and researching.</p>		

Core vocabulary needed for this subject/topic:	<p><b>Subject:</b> Biology, Chemistry, Physics Observe, pattern, identifying, classifying, investigating, fair test, researching</p> <p><b>Topic:</b> Energy: kinetic, thermal, chemical, gravitational, elastic, electrostatic, magnetic, nuclear Renewable energy, non-renewable energy, fossil fuels</p> <p>Forces: push, pull, contact force, non-contact force, friction, mass, weight, kilograms, Newtons</p>			
Vocabulary pupils will have accessed in other topics or subject areas:	Energy, force, push, pull, gravity, friction, air resistance, water resistance, magnet, Newtons (N), measure			
Key vocabulary taught within this topic:	<p>Energy: kinetic, thermal, chemical, gravitational, elastic, electrostatic, magnetic, nuclear Renewable energy, non-renewable energy, fossil fuels</p> <p>Forces: push, pull, contact force, non-contact force, friction, mass, weight, kilograms, Newtons</p>			
<b>Prior knowledge: what pupils may already have studied</b>				
Key stage	Subject	Topic title	Term/year taught	Content/What might pupils already know?
KS3	Science	Energy	Summer 1/Year 1	Pupils will have learnt about different types of energy including magnetic energy and gravitational energy.
KS3	Science	Forces and magnets	Summer 2/Year 2	Pupils will have learnt about different forces and had the opportunity to explore the different forces.
KS4	Science	Electricity and magnets	Spring 2/Year 2	Pupils will have an understanding of how electricity works and electricity travels around a circuit. Pupils will have also explored what a magnet is and will be able to identify if an object is magnetic or not.
KS3 & 4	Maths	Measure	Every year	Pupils will have knowledge of measuring length and weight using standard and non-standard units of measure. They will also have compared different types of measure.
Links to other subjects: Maths				

	<u>OU P Steps 5-6</u>	<u>OU P Steps 7-8</u>	<u>OU Step 1</u>	<u>OU Step 2</u>	<u>OU Step 3</u>
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<p><b><u>Subject specific knowledge</u></b></p>	<p>Identify 4/8 forms of energy from a list.</p> <p>Can sort renewable and non-renewable energy.</p> <p>Know that some materials keep you warmer than others.</p> <p>Identify features of something that is cold or hot.</p> <p>Understand the terms fast and slow.</p>	<p>Can name 4/8 forms of energy with visual clues.</p> <p>Know which energy is the useful energy in an example.</p> <p>Can name renewable forms of energy.</p> <p>Know that some materials keep you warmer than others and name them.</p> <p>Can group materials into good or bad for insulation with some staff guidance.</p> <p>Identify low temperatures mean that something is cold and high temperatures mean something is hot.</p> <p>Can name examples of objects that are fast and objects that are slow.</p>	<p>Can name 6/8 forms of energy with visual clues.</p> <p>Understand that some energy is useful and some energy is not in specific examples.</p> <p>Understand that during energy transfers energy is never lost.</p> <p>Can name forms of renewable and non-renewable energy.</p> <p>Know that fossil fuels will run out.</p> <p>Can group materials into good or bad for insulation.</p> <p>Identify low temperatures mean that something is cold and high temperatures mean something is hot and give approximate temperatures.</p> <p>Describe that speed how fast an object moves.</p>	<p>Can name 8 forms of energy with some visual clues.</p> <p>Understand that some energy is useful and some energy is not.</p> <p>Can name a device/object that can store energy e.g. Batteries.</p> <p>Know that during energy transfers energy is never lost.</p> <p>Know the name of different forms of renewable and non-renewable energy and can identify the difference.</p> <p>Know the different fossil fuels and can explain that they will run out.</p> <p>Identify how unwanted energy transfers can be reduced e.g. insulation.</p> <p>Choose appropriate insulation materials from a selection.</p>	<p>Can name 8 forms of energy.</p> <p>Describe what it means for an energy to be wasted.</p> <p>Understand that some energy can be stored e.g. chemical in batteries.</p> <p>Explain that during energy transfers energy is never lost.</p> <p>Describe how unwanted energy transfers can be reduced e.g. insulation.</p> <p>Know the different forms of renewable and non-renewable energy and can explain why we need renewable energy sources.</p> <p>Can explain how non-renewable energy</p> <p>Name appropriate materials that could be used as insulation.</p> <p>Name temperatures that demonstrate -</p>
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	<p>Understand the words push or pull, and demonstrate what they mean.</p> <p>Understand that we can measure forces.</p> <p>Understand that friction is when 2 objects rub together.</p> <p>Understand the concepts of fair testing.</p> <p>Identify when an investigation has been successful.</p>	<p>Can name examples of where you see push or pull forces.</p> <p>Understand that we can measure forces.</p> <p>Explain that friction is a contact force when 2 objects rub together and it can cause heat.</p> <p>Understand the concepts of fair testing and how to collect results.</p> <p>Identify when an investigation has been successful.</p>	<p>Explain that a force is either a push or pull.</p> <p>Understand that forces are measured in Newtons.</p> <p>Explain that friction is a contact force when 2 objects rub together and it can cause heat.</p> <p>Understand the concepts of method, investigation (fair test) and results.</p> <p>Identify when an investigation has been successful.</p>	<p>Identify low temperatures mean that something is cold and high temperatures mean something is hot and give approximate temperatures.</p> <p>Describe that speed how fast an object moves, and that it can be measured in m/s, kmph, mph.</p> <p>Explain that a force is either push or pull and that these can be contact or noncontact forces.</p> <p>Understand that forces are measured in Newtons or kilonewtons.</p> <p>Explain that friction is a contact force when 2 objects rub together, it causes heat and slows objects down.</p> <p>Understand the concepts of method, investigation (fair test) and results, analysis.</p>	<p>frozen, cold, war, hot, boiling.</p> <p>Describe that speed is the distance an object moves over time, and that it can be measured in m/s, kmph, mph.</p> <p>Explain that a force is either push or pull and that these can be contact or noncontact forces.</p> <p>Give examples of contact or non-contact forces.</p> <p>Understand that forces are measured in Newtons or kilonewtons and that 1N is 10G.</p> <p>Explain that friction is a contact force when 2 objects rub together, it causes heat and slows objects down.</p>
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				Be aware that an evaluation is used to identify things that could be improved.	Describe that friction would increase the contact force.  Understand the concepts of method, investigation (fair test), results, analysis and evaluation.
<b><u>Subject specific skills</u></b>	<p>Is able to measure distance using markers.</p> <p>Is able to tell someone to start and stop a stop watch using symbols or words to measure time.</p> <p>Is able to follow a set of demonstrations to carry out a simple investigation.</p>	<p>Is able to measure distance using non-standard units of measure (cubes, paper clips).</p> <p>Is able to use a stop watch to time how long it takes something to travel.</p> <p>Is able to make a prediction from a choice of 3 using symbols.</p> <p>Is able to follow a picture method to carry out a simple investigation.</p> <p>Is able to identify one thing that has changed when completing a fair test.</p> <p>Identifies the correct result in a table.</p>	<p>Is able to measure a force using Newtons (N)</p> <p>Is able to measure distance to the nearest centimetre.</p> <p>Is able to use a stop watch to time how long it takes something to travel.</p> <p>Is able to select an appropriate prediction from a given choice.</p> <p>Is able to follow a word and picture method to carry out a simple investigation.</p> <p>Is able to suggest what to change when completing a fair test.</p> <p>Is able to record results in a simple table.</p>	<p>Is able to measure a force using Newtons (N)</p> <p>Is able to measure distance in centimetres and metres.</p> <p>Is able to use a stop watch to time how long it takes something to travel.</p> <p>Is able to make a prediction linked to their investigation.</p> <p>Is able to follow a written set of instructions to carry out a simple investigation.</p> <p>Is able to explain why their investigation included a fair test.</p>	<p>Is able to measure a force using Newtons (N)</p> <p>Is able to measure distance in centimetres and metres.</p> <p>Is able to use a stop watch to time how long it takes something to travel.</p> <p>Is able to make predictions.</p> <p>Is able to follow a written set of instructions to carry out a simple investigation.</p> <p>Is able to design an experiment to include a fair test.</p> <p>Is able to record results in a suitable table.</p>

			<p>Analyses results in the form of tables, simple bar graphs and a brief descriptions using key words or sentence blanks.</p>	<p>Is able to record results in a suitable table.</p> <p>Is able to record results in the form of a simple bar graph.</p> <p>Analyses results in the form of tables, simple bar graphs and a brief description.</p>	<p>Analyses results in the form of tables, simple bar graphs and a brief description.</p> <p>Is able to draw conclusions from their results.</p>
<p><b><u>Personal development</u></b></p>	<p><b><u>Problem solving</u></b> Investigations and matching exercises</p> <p><b><u>Communication skills</u></b> Working as pairs in investigations, asking and answering questions</p> <p><b><u>Self-belief</u></b> Learning new skills, practising them and demonstrating them.</p> <p><b><u>Self-management</u></b> Working with new equipment</p> <p><b><u>Teamwork</u></b> Working as groups to solve problems or find out new information</p>				
<p><b><u>Suggested activities</u></b></p>	<p>Learn about the different forms of energy - kinetic, thermal, chemical, gravitational, elastic, electrostatic, magnetic, nuclear</p> <p>Energy Circus.</p> <p>Insulation Investigation.</p> <p>Fast or slow exercise</p> <p>Measuring mass in Newtons with Newtonmeters.</p> <p>Measuring temperature using thermometers</p> <p>Creating insulation.</p> <p>Look at fossil fuels &amp; non-renewable energy.</p> <p>Looking at renewable energy.</p>				
<p><b><u>Possible Investigations</u></b></p>	<p>Speed investigation -Car and track with speed gates.</p> <p>Investigate different forms of energy.</p> <p>Push or pull</p> <p>Friction in shoes investigation.</p> <p>Friction - surface investigation - change the surface of the ramp and measure the distance the car travels.</p>				

**Online resources**

Twinkl

CLEAPPS for risk assessments

BBC bitesize for video resources.

**Evidencing Work**

All work / evidence sheets need to be printed off, annotated by staff, self-assessed by pupils and stored in student folders.

RRS Articles:

This unit of work is linked to Articles of the UN Convention on the Rights of the Child.

Article 13 (freedom of expression)

Article 24 (health and health services)

Article 29 (goals of education)