

# Scheme of work: Energy, forces and the structure of matter

## Entry Level Certificate Physics – Component 5

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This resource provides guidance for teaching component 5: Energy, forces and the structure of matter from our new Entry Level Certificate Science. It is based on the specification (5960).

The scheme of work is designed to be a flexible medium term plan for teaching content and development of the skills that will be assessed.

We have provided it in Word format to help you create your own teaching plan – you can edit and customise it according to your needs. This scheme of work is not exhaustive; it only suggests activities and resources you could find useful in your teaching.

### 3.5 Component 5 – Physics: Energy, forces and structure of matter

Spec ref.	Summary of the specification content	Learning outcomes <i>What most students should be able to do</i>	Suggested timing (hours)	Opportunities to develop Scientific Communication skills	Opportunities to develop and apply practical and enquiry skills	Resources <i>Reference to past questions that indicate success</i>
3.5.1 <b>O1</b>	Changes in energy storage	Describe the change in the way energy is stored in a simple system change such as when a kettle boils.  Recognise that not all the changes are useful.  Identify the main energy wastages in a range of devices.	½	Use scientific vocabulary correctly.  Discussion to identify 'useful' and 'wasted energy' changes.	Circus (real or virtual) of everyday devices in use eg kettle, hairdryer, vacuum cleaner	<a href="#">Teachit Science - Energy changes</a>  <a href="#">BBC Bitesize - Energy stores and transfers</a>  <a href="#">WWF - Wasting energy</a>
<b>O2</b>	Energy transfers and efficiency	Recognise that energy cannot be created or destroyed.  Explain that in any energy transfer, some energy is stored in less useful ways and is described as 'wasted' energy.  Identify ways in which the unwanted energy transfers can be reduced.	1	Use scientific vocabulary correctly.  Use AQA Teachit KS3 Energy transfers as a peer assessment task to check understanding.  Use AQA Teachit KS3 Energy Use to contextualise everyday tasks in terms of energy  Sequence instructions to carry out an investigation into factors affecting rate of cooling.	Leslie's cube to demonstrate difference in surface cooling.	<a href="#">Eco Kids - Energy efficiency</a>  <a href="#">Teachit Science - Energy transfers peer assessment</a>  <a href="#">Teachit Science - Energy use</a>  <a href="#">Wisc-Online - Heat transfer</a>

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		<p>Explain how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls.</p> <p>Recall that the higher the thermal conductivity of a material, the higher the rate of energy transfer by conduction across the material.</p>			<p>Compare cooling of drinks with lid on/off.</p> <p>TDA (Teacher-devised assignment) opportunity: Investigate factors that affect the rate of cooling of a container of water eg surface area, initial temperature, types of insulation, colour of the container.</p> <p>TDA opportunity: Investigate the thermal conductivity of different materials eg which is better for a saucepan handle: wood or metal?</p>	<p><a href="#">Energy saving trust - Roof and wall insulation</a></p> <p><a href="#">Energy transfer</a></p>
<b>O3</b>	Energy resources	Explain what is meant by 'fuel' and 'fossil fuel'.	1	Use IT to research the advantages and disadvantages of different energy resources.	Demonstrate electricity generation by building models of windmill (using	<a href="#">BBC Bitesize - Fuels and energy sources</a>

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		Identify energy resources as renewable or non-renewable.		Discuss/debate the advantages and disadvantages of different types of energy resources.	hairdryer) or water mill to turn a turbine and generate a voltage.  Investigate the relationship between the distance from a light source and a solar (photoelectric) cells on the voltage generated.	
3.5.2 O4	Types of forces	Describe a force as a push or pull acting on an object due to an interaction with another force.  Recall that forces are either: contact forces or non-contact forces  c.f. 3.6.3 Outcome 5 Magnets	½	Discuss everyday activities in terms of the forces involved and identify these as 'push' or 'pull'.	Use newton meters to experience a range of pushes/pulls for lab/everyday objects  Attraction/repulsion of magnets; attraction of magnetic materials eg paperclips/iron filings	<a href="#">Teachit Science - Introduction to forces</a>  <a href="#">BBC Bitesize - Forces</a>
O5	Effects of forces	Explain that work is done when a force causes an object to move	1	Use scientific vocabulary correctly.	TDA opportunity: Investigate how different surface	

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		through a distance. (No calculations needed)  Explain that when work is done against frictional forces acting on an object, there is a rise in temperature.			affect the amount of friction on a moving block.	<a href="#">BBC Bitesize - Forces and movement</a>
3.5.3 <b>O6</b>	Speed	Recall that speed is measured by the distance travelled in a certain time.  Recall the units for speed as metres per second, kilometres per hour and miles per hour.  Calculate average speed using the equation:  speed = distance/time	1	Use scientific vocabulary correctly.	TDA opportunity: Investigate how the speed of a trolley (or model car) changes as it rolls down a slope.	<a href="#">BBC Bitesize - Motion</a>  <a href="#">BBC Bitesize - Forces and movement, Car speed</a>
<b>O7</b>	Stopping distances	Recall that the stopping distance of a vehicle is the sum of the distance the vehicle travels during the driver's reaction time (thinking distance) and the distance it travels under the braking force (braking distance).  Explain that, for a given braking force, the greater the speed of the	½	Use scientific vocabulary correctly.		The Highway Code  <a href="#">Brake - Speed limits and stopping distances</a>

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		vehicle, the greater the stopping distance.				
<b>O8</b>	Reaction times and stopping distances	<p>Recognise that the typical reaction time for a person ranges from 0.5s to 0.9s.</p> <p>Measure human reaction times.</p> <p>Describe how a driver's reaction time can be affected by tiredness, drugs and alcohol and distractions.</p> <p>NB See Biology 3.1.4 Outcome 8</p>	1		TDA opportunity: Investigate factors that affect human reaction time eg tiredness, distraction, practice.	<a href="#">RoSPA - Stopping distances</a>
<b>O9</b>	Weather conditions and braking distances	Explain how the braking distance of a vehicle can be affected by adverse road and weather conditions and the poor condition of the vehicle.	½			

3.5.4 <b>O10</b>	Radioactivity	<p>Recall that some atomic nuclei are unstable and produce ionising radiation.</p> <p>Recall that nuclear radiation may be emitted as:</p> <ul style="list-style-type: none"> <li>• alpha particles</li> <li>• beta particles</li> <li>• gamma rays.</li> </ul> <p>Describe the penetration of materials and range in air of ionising radiation.</p> <p>Describe the uses and dangers of the three types of radiation.</p>	1	<p>Use scientific vocabulary correctly.</p> <p>Use AQA Teachit KS4 Ionising Radiation to consolidate understanding.</p>	Research uses and dangers of radioactivity.	<p><a href="#">BBC Bitesize - Intro to radioactivity pt 1</a></p> <p><a href="#">Teachit Science - Ionising radiation card sort</a></p> <p><a href="#">BBC Bitesize - Intro to radioactivity pt 2</a></p> <p><a href="#">BBC Bitesize - Properties of radiation</a></p>
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