

## Curriculum Plans: Year 9 Physics

	Topic	Knowledge: By the end of the unit students will know:	Skills: What skills will students have developed by the end of this unit?	Key terms: What new key terms and vocabulary will be learnt in this unit?	Summative Assessment: How will pupils be assessed in this unit?
Topic 1	Energy stores, Conservation of Energy, Energy Equations, Work, energy and efficiency	<p><b>describe the nature of energy stores in detail including the relationship between objects.</b></p> <p><b>explain factors that affect the size of changes in energy stores.</b></p> <p><b>apply the law of conservation of energy to explain why forces cause heating effects.</b></p> <p><b>describe closed systems and the changes to energy stores within them using the principle of conservation of energy.</b></p> <p><b>perform calculations using rearrangements of the gravitational potential energy store equations.</b></p> <p><b>perform calculations involving the rearrangement of the kinetic energy equation.</b></p> <p><b>perform calculations involving the rearrangement of the elastic potential energy equation</b></p>	<p>perform a wide range of calculations involving transfer of energy.</p> <p>apply the equation for work done in a wide range of contexts.</p> <p>evaluate in detail an experiment to measure work done, explaining why there is variation in the measurements.</p> <p>represent energy changes graphically, accounting for changes in all stores.</p>	<p><b>Atomic/nuclear energy:</b> <i>a term used to describe energy when it is stored inside atoms. It is another name for nuclear energy.</i></p> <p><b>Chemical energy:</b> <i>a term used to describe energy when it is stored in chemical substances. Food, fuel and batteries all store chemical energy.</i></p> <p><b>Dissipated:</b> <i>spread out.</i></p> <p><b>Elastic potential energy/strain energy:</b> <i>a name used to describe energy when it is stored in stretched or squashed things that can stretch back to their original shape. Another name for 'strain energy'.</i></p> <p><b>Energy:</b> <i>something that is needed to make things happen or change.</i></p> <p><b>joules (J):</b> <i>a unit for measuring energy.</i></p> <p><b>Kinetic energy:</b> <i>a term used to describe energy when it is stored in moving things.</i></p> <p><b>Law of conservation of energy:</b> <i>the idea that energy can never be created or destroyed, only transferred from one form to another.</i></p> <p><b>System:</b> <i>a set of things being studied. For example, a kettle, the water in it and its surroundings form a simple system.</i></p> <p><b>Thermal energy:</b> <i>a term used to describe energy when it is stored in hot</i></p>	<p><b>Homework and Independent Study</b></p> <p>HW: Assessed exam-style question sheets; online Seneca tasks.</p> <p>Revision: For topic test 1 ( ~40 mins).</p> <p>IS: Use of online resources including BBC Bitesize, physicanmathstutor.com, Seneca Learning and Kerboodle textbooks (KS3 and 4). Especially check the "Appendices" of the KS4 books for useful Maths and How Science Works sections. YouTube channels – Free Science Lessons, Primrose Kitten.</p> <p>S + C: Focus on using GCSE-level Kerboodle textbooks; BBC Science and Tech news sections <a href="https://www.bbc.co.uk/news">https://www.bbc.co.uk/news</a>, for independent research). Attempting past-paper GCSE questions on Physics</p>

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				<p><i>objects. The hotter something is, the more thermal energy it has. Sometimes called 'heat energy'.</i></p> <p><b>Work:</b> <i>the energy transferred by a force. Work done (joules, J) = force (newtons, N) x distance moved in the direction of the force (metres, m).</i></p> <p><b>Work done:</b> <i>a measure of the energy transferred when a force acts through a distance.</i></p>	
Topic 2	<b>Energy, circuits and power</b>	<p>how electric circuits are shown as diagrams.</p> <p>the difference between a battery and a cell.</p> <p>Calculate the size of an electric current from the charge flow and the time taken.</p> <p>Write down Ohm's law.</p> <p>what is meant by efficiency.</p> <p>how energy is supplied to our homes.</p> <p>what most everyday electrical appliances are used for.</p> <p>how to choose an electrical appliance for a particular job.</p> <p>what is meant by power.</p> <p>calculate the power of an appliance.</p> <p>Calculate the efficiency of an appliance in terms of power.</p>	<p>I can use a wide range of energy stores and physical processes to decide on wasted and useful energy transfers.</p> <p>I can rearrange the efficiency equation to find input or total output energy</p> <p>I can apply the efficiency equation in a range of situations, including rearrangement of the equation.</p>	<p><b>Efficiency:</b> <i>the proportion of input energy that is transferred to a useful form. A more efficient machine wastes less energy.</i></p> <p><b>Energy:</b> <i>something that is needed to make things happen or change.</i></p> <p><b>joules (J):</b> <i>a unit for measuring energy</i></p> <p><b>Law of conservation of energy:</b> <i>the idea that energy can never be created or destroyed, only transferred from one form to another.</i></p> <p><b>Power:</b> <i>the amount (rate) of energy transferred per second. The units are watts (W).</i></p> <p><b>System:</b> <i>a set of things being studied. For example, a kettle, the water in it and its surroundings form a simple system.</i></p> <p><b>Useful energy:</b> <i>energy transferred to where it is wanted in the way that is wanted.</i></p> <p><b>Wasted energy:</b> <i>energy that is not usefully transferred.</i></p> <p><b>watts (W):</b> <i>the unit for measuring power. 1 watt = 1 joule of energy transferred every second</i></p>	<p>HW: Assessed exam-style question sheets; online Seneca tasks.</p> <p>Revision: For topic test 1 (~40 mins).</p> <p>IS: Use of online resources including BBC Bitesize, physicanmathstutor.com, Seneca Learning and Kerboodle textbooks (KS3 and 4). Especially check the "Appendices" of the KS4 books for useful Maths and How Science Works sections. YouTube channels – Free Science Lessons, Primrose Kitten.</p> <p>S + C: Focus on using GCSE-level Kerboodle textbooks; BBC Science and Tech news sections <a href="https://www.bbc.co.uk/news">https://www.bbc.co.uk/news</a>, for independent research). Attempting past-paper GCSE questions on Physics</p>

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Topic 3	<h3>Energy transfer by heating.</h3>	<p>which materials make the best conductors.</p> <p>Describe how the thermal conductivity of a material affects the rate of energy transfer through it by conduction.</p> <p>Describe how the thickness of a layer of material affects the rate of energy transfer through it by conduction.</p> <p>Describe what the specific heat capacity of a substance means.</p> <p>Calculate the energy needed to change the temperature of an object.</p> <p>Describe how the mass of a substance affects how quickly its temperature changes when you heat it.</p> <p>Describe how to measure the specific heat capacity of a substance.</p> <p>Describe how you can reduce the rate of energy transfer from your home.</p>	<p>explain the different thermal conductivities of materials using the free electron and lattice vibration explanations of conduction.</p> <p>evaluate the results of an experiment into thermal conductivity in terms of repeatability and reproducibility of data, and the validity of conclusions drawn from the data.</p> <p>can justify the choices of material involved in insulation or conduction using the concept of thermal conductivity and other data.</p>	<p><b>Absorb:</b> <i>to soak up or take in – for waves, it is when the wave disappears as the energy it is carried is transferred to a material.</i></p> <p><b>Black body radiation:</b> <i>the radiation emitted by a perfect black body (a body that absorbs all the radiation that hits it).</i></p> <p><b>Conduction:</b> <i>the way energy is transferred through solids by heating. Vibrations are passed on from particle to particle.</i></p> <p><b>Convection:</b> <i>circulation of a liquid or gas (fluid) caused by increasing its thermal energy.</i></p> <p><b>Infrared Radiation:</b> <i>electromagnetic waves between visible light and microwaves in the electromagnetic spectrum.</i></p> <p><b>Specific heat capacity:</b> <i>energy needed to raise the temperature of 1kg of a substance by 1°C.</i></p> <p><b>Thermal conductivity:</b> <i>property of a material that determines the energy transfer through it by conduction.</i></p> <p><b>Thermal Conductor:</b> <i>a material that allows energy to be transferred through it easily by heating.</i></p> <p><b>Thermal Insulator:</b> <i>a material that does not allow energy to be transferred through it easily by heating.</i></p>	<p>HW: Assessed exam-style question sheets; online Seneca tasks.</p> <p>Revision: For topic test 1 (~40 mins).</p> <p>IS: Use of online resources including BBC Bitesize, physicanmathstutor.com, Seneca Learning and Kerboodle textbooks (KS3 and 4). Especially check the “Appendices” of the KS4 books for useful Maths and How Science Works sections. YouTube channels – Free Science Lessons, Primrose Kitten.</p> <p>S + C: Focus on using GCSE-level Kerboodle textbooks; BBC Science and Tech news sections <a href="https://www.bbc.co.uk/news">https://www.bbc.co.uk/news</a>, for independent research). Attempting past-paper GCSE questions on Physics</p>
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Topic 4	<p><b>Energy resources.</b></p>	<p>Describe how most energy demands are met today. Name the energy resources that are used. Describe how nuclear fuels are used in power stations. Name the other fuels that are used to generate electricity. Describe how waves and tides can be used to generate electricity. Name the type of power station that uses water running downhill to generate electricity. Describe the difference between a panel of solar cells and a solar heating panel. Describe how geothermal energy can be used to generate electricity. Explain why people are concerned about nuclear power. Describe the advantages and disadvantages of renewable energy resources. Evaluate the use of different energy resources. Compare the economic costs of different energy resources. Name energy resources that need to be developed to meet people's energy needs in the future.</p>	<p>Compare energy use from different sources and different societies from available data. Compare fossil fuels and nuclear fuels in terms of energy provided, waste, and pollution Compare the operation of hydroelectric, wave, and tidal systems in terms of reliability, potential power. Justify the choice of an energy resource by using numerical and other appropriate data. Calculate the energy provided by a solar heating system by using the</p>	<p><b>Biofuel:</b> <i>any fuel taken from living or recently living materials, such as animal waste.</i> <b>Carbon-neutral:</b> <i>a biofuel from a living organism that takes in as much carbon dioxide from the atmosphere as is released when the fuel is burned.</i> <b>Fossil fuels:</b> <i>a fuel formed from the dead remains of organisms over millions of years (e.g. coal, oil, or natural gas).</i> <b>Geothermal energy:</b> <i>energy that comes from energy released by radioactive substances deep within the Earth.</i> <b>Hydroelectricity:</b> <i>electricity generated by moving water, usually falling from a reservoir, to turn turbines and generators.</i> <b>Non--renewable:</b> <i>any energy resource that will run out because it cannot be renewed, e.g. oil.</i> <b>Nuclear fuel:</b> <i>substance used in nuclear reactors that releases energy due to nuclear fission.</i> <b>Reactor core:</b> <i>the thick steel vessel used to contain fuel rods, control rods and the moderator in a nuclear fission reactor.</i> <b>Renewable energy:</b> <i>energy from natural sources that is always being replenished so it never runs out.</i> <b>Solar cell:</b> <i>a flat plate that uses energy transferred by the light to produce electricity.</i> <b>Tidal power:</b> <i>generating electricity using the movement of tides.</i></p>	<p>HW: Assessed exam-style question sheets; online Seneca tasks. Revision: For topic test 1 (~40 mins). IS: Use of online resources including BBC Bitesize, physicanmathstutor.com, Seneca Learning and Kerboodle textbooks (KS3 and 4). Especially check the "Appendices" of the KS4 books for useful Maths and How Science Works sections. YouTube channels – Free Science Lessons, Primrose Kitten. S + C: Focus on using GCSE-level Kerboodle textbooks; BBC Science and Tech news sections <a href="https://www.bbc.co.uk/news">https://www.bbc.co.uk/news</a>, for independent research). Attempting past-paper GCSE questions on Physics.</p>
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Topic 5	<p><b>Electricity in the Home</b></p>	<p>Describe the current, potential difference, and resistance for each component in a series circuit. Describe the potential difference of several cells in series. Calculate the total resistance of two resistors in series. Explain why adding resistors in series increases the total resistance. Describe the currents and potential differences for components in a parallel circuit. Calculate the current through a resistor in a parallel circuit. Explain why the total resistance of two resistors in parallel is less than the resistance of the smaller individual resistor. Explain why adding resistors in parallel decreases the total resistance.</p>	<p>Explain the nature of an electric current in wires in terms of electron behaviour. Perform a range of calculations, including rearrangement of the equation <math>Q=It</math>. Measure the current in a circuit accurately and use it to Calculate the rate of flow of electrons</p>	<p><b>Alternating current:</b> <i>electric current in a circuit that repeatedly reverses its direction.</i></p> <p><b>Circuit breakers:</b> <i>an electrical component that interrupts the current in a circuit if there is a fault and the current rises to dangerous levels</i></p> <p><b>Diode:</b> <i>a non-ohmic conductor that has a much higher resistance in one direction (its reverse direction) than in the other direction (its forward direction).</i></p> <p><b>Direct current:</b> <i>electric current in a circuit that is in one direction only.</i></p> <p><b>Earth wire:</b> <i>the wire in a mains cable used to connect the metal case of an appliance to earth.</i></p> <p><b>Fuse:</b> <i>a fuse contains a thin wire that melts and cuts the current off if too much current passes through it.</i></p> <p><b>Light-dependent resistor (LDR):</b> <i>a resistor whose resistance depends on the intensity of the light incident on it.</i></p>	<p>HW: Assessed exam-style question sheets; online Seneca tasks. Revision: For topic test 1 (~40 mins). IS: Use of online resources including BBC Bitesize, physicanmathstutor.com, Seneca Learning and Kerboodle textbooks (KS3 and 4). Especially check the "Appendices" of the KS4 books for useful Maths and How Science Works sections. YouTube channels – Free Science Lessons, Primrose Kitten. S + C: Focus on using GCSE-level Kerboodle textbooks; BBC Science and Tech news sections <a href="https://www.bbc.co.uk/news">https://www.bbc.co.uk/news</a>, for independent research).</p>

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		<p>Describe what happens when you reverse the potential difference across a resistor.</p> <p>Describe what happens to the resistance of a filament lamp as its temperature increases.</p> <p>Describe how the current through a diode depends on the potential difference across it.</p> <p>Describe what happens to the resistance of a temperature-dependent resistor as its temperature increases.</p> <p>Describe what happens to the resistance of a light-dependent resistor as the light level increases.</p> <p>Write down what direct current is and what alternating current is.</p> <p>Describe what is meant by the live wire and the neutral wire of a mains circuit.</p> <p>Describe the National Grid.</p> <p>Describe what the casing of a mains plug or socket is made of and explain why.</p> <p>Write down what is in a mains cable.</p> <p>Write down the colours of the live, neutral, and earth wires.</p> <p>Explain why a three-pin plug includes an earth pin.</p>	<p>Rearrange equations for resistance and potential difference.</p> <p>Describe potential difference in terms of work done per unit charge.</p> <p>Investigate a variety of factors that may affect the resistance of a metal wire, such as the current through it, length, cross-sectional area, and metal used.</p> <p>Determine the resistance of a component based on information extracted from an <math>I</math>-<math>V</math> graph.</p> <p>Evaluate in detail the investigation of series circuits and explain discrepancies.</p>	<p><b>Light-emitting diode (LED):</b> <i>a diode that emits light when it conducts.</i></p> <p><b>Live wire:</b> <i>the mains wire that has a voltage that alternates in voltage (between + 325V and 325 V in Europe).</i></p> <p><b>Neutral wire:</b> <i>the wire of a mains circuit that is earthed at the local substation so its potential is close to zero.</i></p> <p><b>Parallel:</b> <i>components connected in a circuit so that the potential difference is the same across each one.</i></p> <p><b>Power:</b> <i>the amount of energy (in joules) transferred every second. It is measured in watts (W).</i></p> <p><b>Series:</b> <i>components connected in a circuit in such a way that the same current passes through them.</i></p> <p><b>Thermistor:</b> <i>a resistor whose resistance depends on the temperature of the thermistor.</i></p>	<p>Attempting past-paper GCSE questions on Physics.</p>
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			Evaluate in detail an investigation into the effect of adding resistors in parallel on a circuit.		
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