Long-term planning

Physics - Year 9

Year 9 GCSE Physics	Autumn term 1	Autumn term 2	Spring term 1	Spring term 2	Summer term 1	Summer term 2
Conservation and dissipation of energy. Energy transfer by heating. Energy resources.	**Students will know that**					
	A system is an object or group of objects. There are changes in the way energy is stored when a system changes. Energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed. Energy is measured in Joules (J). Power is defined as the rate at which energy is transferred or the rate at which work is done. The gravitational potential energy of an object depends on its mass, the height it has been raised and the gravitational field it is in.	The energy of a moving object depends on its mass and velocity. The energy of a stretched spring is dependent on the extension of the spring and its spring constant. Efficiency is how well energy is transferred usefully as a decimal or a %.	Lubrication and insulation can reduce unwanted energy transfers. The higher the thermal conductivity of a material the higher the rate of thermal energy transfer through hat material. The rate of cooling of a building is dependent on the thickness and thermal conductivity of the walls.	The specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius. The amount of energy stored or released in a system can be calculated using its mass, change in temperature and specific heat capacity.	There is a wide range of energy resources available on Earth. Energy resources are used for transport, electricity generation and heating. Certain energy resources, called non-renewable, are finite. Fossil fuels and nuclear fuels are non-renewable.	Certain energy resources called renewable, can be replenished. Geothermal, solar, waves, tidal HEP, wind are renewable.
	Students will know how to					
	Describe all the changes involved in the way energy is stored when a system changes, for common situations. **WS 3.5** Recall and apply **MS 3b, c** $power = \frac{energy\ transferred}{time}$ $\left[P = \frac{E}{t}\right]$ $power = \frac{work\ done}{time}$ $\left[P = \frac{W}{t}\right]$ Recall and apply **MS 3b, c** GPE = mass x gravity x height	Recall and apply **MS 3b, c** Kinetic energy = ½ x mass x velocity x velocity $\left[E_k = \frac{1}{2} m v^2\right]$ Apply **MS 3b, c** Elastic energy = ½ x spring constant x extension x extension $\left[E_e = \frac{1}{2} k e^2\right]$ Investigate the transfer of energy from a GPE to a KE store. **AT 1**	Investigate thermal conductivity using rods of different materials. **AT1, AT5** **(Required practical 2)** Investigate effectiveness of different materials as thermal insulators. **AT1, AT5, Multiple WS and MS.**	Apply **MS 3b, c** Change in thermal energy = mass x specific heat capacity x change in temperature $[\Delta E = m c \Delta\theta]$ **(Required practical 1)** Investigate situations to determine the specific heat capacity of different substances. **AT1, AT5, Multiple WS and MS.**	Describe the disadvantages and advantages of non-renewable resources, including cost, reliability and environmental impact. **WS 1.3, 1.4, 4.4**	Describe the disadvantages and advantages of renewable resources, including cost, reliability and environmental impact. **WS 1.3, 1.4, 4.4** Explain patterns in uses of energy resources. **WS 3.5** Compare advantages and disadvantages of different energy resources. **WS 1.3, 1.4, 4.4**

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	$\left[E_p = m\,g\,h \right]$	Use calculations to show how the overall energy is redistributed when the system changes. **WS 1.2, 4.3. 4.5, 4.6** **MS 1a, c, 3b, c** Recall and apply **MS 3b, c** $efficiency = \frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$ $efficiency = \frac{useful\ power\ output}{total\ power\ input}$ **(HT)** Increase the efficiency of an intended energy transfer **WS 1.**				
	Vocabulary and the concepts they link to					
	Joule Dissipation Kinetic Gravitational potential Thermal Elastic Nuclear Magnetic Chemical Electrical Mechanical Radiation Heating System	Efficiency Delta	Lubrication Friction Insulation Conduction Conductivity Insulation Celsius	Specific heat capacity Theta	Finite	Replenish Geothermal Hydroelectric Solar
	Assessment					
	6-mark question key pieces.	6-mark question key pieces. Mixed subject assessment task.	6-mark question key pieces.	6-mark question key pieces. Energy assessment task.	6-mark question key pieces. End of topic assessment task.	6-mark question key pieces. End of year 9 Assessment.

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	Diversity & development of cultural capital					
	Big bang theory and conservation of energy. Nuclear power stations. Power on electrical appliances.	Collisions, highway code, (KE) Suspension, trampolines, mattresses (EPE). Efficiency ratings of appliances and houses.	Lubrication of bikes/cars to keep them working. Clothing design and choice to keep warm. Oven gloves or handling hot/cold objects. House insulation.	Production of convection currents and weather systems. Sand on the beach in summer.	Global warming and greenhouse gases. Carbon footprint. Industry in developing countries	Environmental impact. Sustainable future.
	Cross-curricular opportunities and enrichment					
	Chemistry conservation of mass/energy. RE, the big bang. Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures.	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures.	Textiles, cooking and DT.	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures.	History (industrial revolution). Geography. Politics and ethics.	Geography. Politics and ethics.