

Physics 1		Higher and Separate Physics	
Red 	Amber 	Green 	
1. Conservation & Dissipation of Energy	Define a system as an object or group of objects and state examples of changes in the way energy is stored in a system		
	Describe how all the energy changes involved in an energy transfer and calculate relative changes in energy when the heat, work done or flow of charge in a system changes		
	Use calculations to show on a common scale how energy in a system is redistributed		
	Describe energy transfers involved when work is done and calculate the work done by recalling and using the equation: $[W = Fs]$		
	Describe what a joule is and state what the joule is derived from		
	Convert between newton-metres and joules.		
	Explain why work done against the frictional forces acting on an object causes a rise in the temperature of the object		
	Calculate the kinetic energy of an object by recalling and applying the equation: $[E_k = \frac{1}{2}mv^2]$		
	Calculate the amount of elastic potential energy stored in a stretched spring by applying, but not recalling, the equation: $[E_e = \frac{1}{2}ke^2]$		
	Calculate the amount of gravitational potential energy gained by an object raised above ground level by recalling and applying, the equation: $[E_e = mgh]$		
	Define power as the rate at which energy is transferred or the rate at which work is done and the watt as an energy transfer of 1 joule per second		
	Calculate power by recalling and applying the equations : $[P = E/t \ \& \ P = W/t]$		
	Explain, using examples, how two systems transferring the same amount of energy can differ in power output due to the time taken		
	State that energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed and so the total energy in a system does not change		
	Explain that only some of the energy in a system is usefully transferred, with the rest 'wasted', giving examples of how this wasted energy can be reduced		
	HT ONLY: Suggest and explain ways to increase the efficiency of an intended energy transfer		
Calculate efficiency by recalling and applying the equation: $[\text{efficiency} = \text{useful power output} / \text{total power input}]$			

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2. Energy Transfer by Heating	Explain ways of reducing unwanted energy transfers and the relationship between thermal conductivity and energy transferred		
	Required practical: investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material.		
	Describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls		
	Calculate the amount of energy stored in or released from a system as its temperature changes by applying, but not recalling, the equation: $[\Delta E = mc\Delta\theta]$		
	Define the term 'specific heat capacity'		
	Required practical: investigation to determine the specific heat capacity of one or more materials.		
3. Energy Resources	List the main renewable and non-renewable energy resources and define what a renewable energy resource is		
	Compare ways that different energy resources are used, including uses in transport, electricity generation and heating		
	Explain why some energy resources are more reliable than others, explaining patterns and trends in their use		
	Evaluate the use of different energy resources, taking into account any ethical and environmental issues which may arise		
	Justify the use of energy resources, with reference to both environmental issues and the limitations imposed by political, social, ethical or economic considerations		

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4. Electric Circuits	Draw and interpret circuit diagrams, including all common circuit symbols		
	Define electric current as the rate of flow of electrical charge around a closed circuit		
	Calculate charge and current by recalling and applying the formula: $[Q = It]$		
	Explain that current is caused by a source of potential difference and it has the same value at any point in a single closed loop of a circuit		
	Describe and apply the idea that the greater the resistance of a component, the smaller the current for a given potential difference (p.d.) across the component		
	Calculate current, potential difference or resistance by recalling and applying the equation: $[V = IR]$		
	Required practical: Use circuit diagrams to set up and check circuits to investigate the factors affecting the resistance of electrical circuits		
	Define an ohmic conductor		
	Explain the resistance of components such as lamps, diodes, thermistors and LDRs and sketch/interpret IV graphs of their characteristic electrical behaviour		
	Explain how to measure the resistance of a component by drawing an appropriate circuit diagram using correct circuit symbols		
	Required practical: use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements		
	Show by calculation and explanation that components in series have the same current passing through them		
	Show by calculation and explanation that components connected in parallel have the same the potential difference across each of them		
	Calculate the total resistance of two components in series as the sum of the resistance of each component using the equation: $[R_{total} = R_1 + R_2]$		
Explain qualitatively why adding resistors in series increases the total resistance whilst adding resistors in parallel decreases the total resistance			
Solve problems for circuits which include resistors in series using the concept of equivalent resistance			

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5. Electricity in the Home	Explain the difference between direct and alternating voltage and current, stating what UK mains is					
	Identify and describe the function of each wire in a three-core cable connected to the mains					
	State that the potential difference between the live wire and earth (0 V) is about 230 V and that both neutral wires and our bodies are at, or close to, earth potential (0 V)					
	Explain that a live wire may be dangerous even when a switch in the mains circuit is open by explaining the danger of providing any connection between the live wire and earth					
	Explain how the power transfer in any circuit device is related to the potential difference across it and the current through it					
	Calculate power by recalling and applying the equations: $[P = VI]$ and $[P = I^2 R]$					
	Describe how appliances transfer energy to the kinetic energy of motors or the thermal energy of heating devices					
	Calculate and explain the amount of energy transferred by electrical work by recalling and applying the equations: $[E = Pt]$ and $[E = QV]$					
	Explain how the power of a circuit device is related to the potential difference across it, the current through it and the energy transferred over a given time.					
	Calculate efficiency by recalling and applying the equation: $[\text{efficiency} = \text{useful power output} / \text{total power input}]$					
	Describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in stored energy when they are in use					
	Identify the National Grid as a system of cables and transformers linking power stations to consumers					
	Explain why the National Grid system is an efficient way to transfer energy, with reference to change in potential difference reducing current					

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6. Molecules & Matter	Calculate the density of a material by recalling and applying the equation: $[\rho = m/V]$			
	Recognise/draw simple diagrams to model the difference between solids, liquids and gases			
	Use the particle model to explain the properties of different states of matter and differences in the density of materials			
	Required practical: use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids			
	Recall and describe the names of the processes by which substances change state			
	Use the particle model to explain why a change of state is reversible and affects the properties of a substance, but not its mass			
	State that the internal energy of a system is stored in the atoms and molecules that make up the system			
	Explain that internal energy is the total kinetic energy and potential energy of all the particles in a system			
	Calculate the change in thermal energy by applying but not recalling the equation $[\Delta E = m c \Delta \theta]$			
	Calculate the specific latent heat of fusion/vaporisation by applying, but not recalling, the equation: $[E = mL]$			
	Interpret and draw heating and cooling graphs that include changes of state			
	Distinguish between specific heat capacity and specific latent heat			
	Explain why the molecules of a gas are in constant random motion and that the higher the temperature of a gas, the greater the particles' average kinetic energy			
	Explain, with reference to the particle model, the effect of changing the temperature of a gas held at constant volume on its pressure			
Calculate the change in the pressure of a gas or the volume of a gas (a fixed mass held at constant temperature) when either the pressure or volume is increased or decreased				

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7. Radioactivity	Describe the basic structure of an atom and how the distance of the charged particles vary with the absorption or emission of electromagnetic radiation			
	Define electrons, neutrons, protons, isotopes and ions			
	Relate differences between isotopes to differences in conventional representations of their identities, charges and masses			
	Describe how the atomic model has changed over time due to new experimental evidence, inc discovery of the atom and scattering experiments (inc the work of James Chadwick)			
	Describe and apply the idea that the activity of a radioactive source is the rate at which its unstable nuclei decay, measured in Becquerel (Bq) by a Geiger-Muller tube			
	Describe the penetration through materials, the range in air and the ionising power for alpha particles, beta particles and gamma rays			
	Apply knowledge of the uses of radiation to evaluate the best sources of radiation to use in a given situation			
	Use the names and symbols of common nuclei and particles to complete balanced nuclear equations, by balancing the atomic numbers and mass numbers			
	Define half-life of a radioactive isotope			
	HT ONLY: Determine the half-life of a radioactive isotope from given information and calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives			
	Compare the hazards associated with contamination and irradiation and outline suitable precautions taken to protect against any hazard the radioactive sources may present			

	Discuss the importance of publishing the findings of studies into the effects of radiation on humans and sharing findings with other scientists so that they can be checked by peer review	
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