



PMT Education

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GCSE

**PHYSICS**

**8463/1H**

Paper 1

Higher Tier

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**Mark scheme**

Predicted Paper 2026 (Based on AQA)



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Question	Answers	Extra information	Mark	Main topic(s) tested
1.1	$E_k = \frac{1}{2}mv^2$ $E_k = 0.5 \times 500 \times 12^2$ $= 36\,000\text{J}$	allow answer given in standard form	1 1	Kinetic energy Energy stores

1.2	kinetic energy of the cart is transferred to elastic potential energy	allow energy stored in the spring / elastic energy increases	1	Energy transfer
	the kinetic energy decreases as the spring is compressed		1	Elastic potential energy

1.3	(A high specific heat capacity means that) the metal can absorb more energy before a change in temperature		1	Specific heat capacity
	(So) the metal does not heat up significantly		1	



Question	Answers	Extra information	Mark	Main topic(s) tested
2.1	House A: series circuit		1	Series and parallel circuits
	House B: parallel circuit		1	

2.2	total resistance is the sum of the resistances of each component in the circuit	allow R total = $R_1+R_2+R_3$	1	Resistance in series circuits
	add the resistance of each lamp together		1	

2.3	in House A (series circuit) the potential difference is shared between the lamps	allow lamps in parallel get full potential difference	1	Potential difference
	(So) each lamp has a lower potential difference (than the lamps in House B)		1	
	(As $P = IV$ ) The power is lower, (so the lamps are dimmer)		1	

2.4	other lamps stay on	allow only one branch is broken / other branches still complete circuit	1	Parallel circuits
	brightness remains the same		1	
		allow no effect on the other lamps		



Question	Answers	Extra information	Mark	Main topic(s) tested
2.5	<p>Any <b>one</b> of the following pairs:</p> <ol style="list-style-type: none"> <li>1. Plug has a <b>fuse</b></li> <li>2. Which <b>breaks the circuit</b> if <b>current</b> is too high</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>1. Plug has an <b>Earth wire</b></li> <li>2. Which prevents the metal casing of the lamp becoming live</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>1. House has a <b>circuit breaker / fuse box</b></li> <li>2. Which <b>breaks the circuit</b> if current is too high</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>1. <b>Double insulation</b> is used around wiring</li> <li>2. Prevents user from touching the <b>live wire</b></li> </ol>	<p>Allow prevents electric shock <b>when touching the casing</b></p>	<p><b>1</b> <b>1</b></p>	<p>Electrical safety in the home</p>



Question	Answers	Extra information	Mark	Main topic(s) tested
3.1	pressure decreases	allow pressure is inversely proportional to volume	1	Gas pressure and volume (Boyle's Law)

	<b>Level 3:</b> The explanation is detailed and logically sequenced, linking work done, energy transfer, particle behaviour and pressure to temperature increase	<b>5-6</b>	Internal energy Gas pressure Work done on gases
	<b>Level 2:</b> Some relevant points are identified, but links between ideas are not fully developed or sequenced	<b>3-4</b>	
	<b>Level 1:</b> Basic ideas are stated but with little or no linkage to the question	<b>1-2</b>	
	<b>No relevant content</b>	<b>0</b>	
	<b>Indicative content</b>		
3.2	<p><b>Work done / energy transfer:</b></p> <ul style="list-style-type: none"> <li>work is done on the gas when it is compressed</li> <li>energy is transferred to the gas particles</li> <li>internal energy of the gas increases</li> </ul> <p><b>Particles:</b></p> <ul style="list-style-type: none"> <li>particles gain kinetic energy</li> <li>particles move faster</li> </ul> <p><b>Pressure:</b></p> <ul style="list-style-type: none"> <li>particles collide with the walls more frequently</li> <li>collisions are more forceful</li> <li>same volume of gas in less space as handle is lowered</li> <li>pressure increases</li> </ul> <p><b>Temperature / heating:</b></p> <ul style="list-style-type: none"> <li>increase in kinetic energy which leads to increase in temperature</li> <li>energy is transferred from the gas to the pump</li> <li>pump becomes warmer</li> </ul>		



Question	Answers	Extra information	Mark	Main topic(s) tested
4.1	$500 \text{ g} = 0.5 \text{ kg}$ $200 \text{ cm}^3 (\div 100^3) = 0.0002 \text{ m}^3$  Density = $\frac{0.5}{0.0002}$  $\rho = 2500 \text{ kg/m}^3$		1 1  1  1	Density calculations

4.2	particles move further apart  volume increases  mass stays the same	allow particles have more energy / weaker forces between particles	1  1  1	States of matter (particle model)
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4.3	energy required to change 1 kg of a substance from a liquid to a gas  without a change in temperature	allow energy per unit mass for change of state (liquid $\rightarrow$ gas)	1  1	Specific latent heat
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4.4	sublimation  energy is transferred to the substance  energy is used to overcome forces between particles  particles move further apart	allow particles gain energy  allow no temperature change during change of state	1  1  1  1	Changes of state (sublimation)  Energy in phase changes
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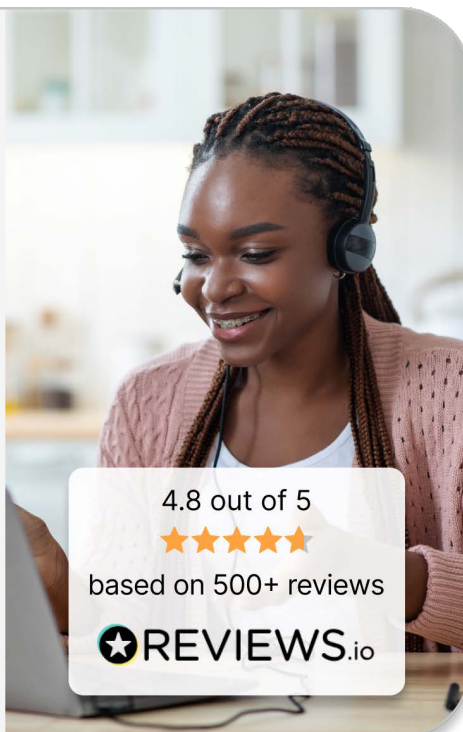
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Question	Answers	Extra information	Mark	Main topic(s) tested
5.1	plum pudding model	allow no nucleus/ positive charge spread throughout the atom	1	Atomic models (plum pudding)
	atom is a sphere of positive charge		1	
	negative electrons are embedded within it		1	

5.2	electrons absorb energy to move to a higher energy level	allow energy transferred by heating/ electrical/ electromagnetic radiation	1	Electron energy levels
	electrons emit energy (as radiation) to move to a lower energy level		1	

5.3	electrons orbit the nucleus at fixed distances in electron shells	ignore number of electrons in shells above 3	1	Bohr model of the atom
	There are two electrons in the first electron shell, 8 in the second shell, 8 in the third shell		1	
	protons are found in the centre of the atom in the nucleus		1	
	mass and charge are concentrated in the centre of the atom		1	
	no neutrons in the nucleus as these had not been discovered yet		1	



Question	Answers	Extra information	Mark	Main topic(s) tested
5.4	number of protons equals number of electrons protons are positive and electrons are negative charges cancel / overall charge is zero		1 1 1	Atomic structure (charges of subatomic particles)



Question	Answers	Extra information	Mark	Main topic(s) tested
6.1	volume of water	allow same beakers / same surroundings (room temperature)	1	Required practical: insulation  Variables
	starting temperature of water		1	

6.2	The process which reduces the transfer of thermal energy	allow slowing heat loss / preventing heat transfer	1	Thermal insulation
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6.3	no cover cools faster than aluminium foil	allow converse statements throughout	1	Rates of cooling  Interpreting data
	no cover has a greater total temperature drop (32°C vs 22°C)	allow higher rate of cooling = larger temperature decrease over time	1	

6.4	rate of temperature decrease = change in temperature ÷ time		1	Rate calculations
	rate = $17 \div 20$		1	
	rate = 0.85 °C/min		1	



Question	Answers	Extra information	Mark	Main topic(s) tested
7.1	to reduce heat loss to the surroundings	allow improve accuracy/ ensure energy heats the substance rather than surroundings	1	Required practical: Specific heat capacity

7.2	any <b>two</b> from: <ul style="list-style-type: none"> <li>• Make sure the heater stays submerged</li> <li>• Repeat the investigation, remove anomalies, and calculate a mean</li> <li>• do not remove the lid</li> </ul>		2	Experimental technique
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7.3	3 kJ = 3000 J		1	Specific heat capacity
	53 g = 0.053 kg			
	Energy transferred to beaker = 0.85 x 3000 = 2550 J		1	
	E = mcΔT 2550 = 0.053 x 850 x ΔT		1	
	$\Delta T = \frac{2550}{0.053 \times 850}$		1	
	ΔT = 56.6 °C		1	



Question	Answers	Extra information	Mark	Main topic(s) tested
7.4	<p><b>Level 3:</b> The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced</p>		5-6	Required practical: Specific heat capacity
	<p><b>Level 2:</b> The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced</p>		3-4	
	<p><b>Level 1:</b> The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear</p>		1-2	
	<p><b>No relevant content</b></p>		0	
	Indicative content			
<p><b>Measurements:</b></p> <ul style="list-style-type: none"> <li>• measure mass of the substance</li> <li>• measure initial temperature</li> <li>• measure final temperature</li> <li>• Temperature change = final temperature – initial temperature</li> </ul> <p><b>Additional equipment needed: voltmeter and ammeter</b></p> <ul style="list-style-type: none"> <li>• ammeter connected in series</li> <li>• voltmeter connected in parallel</li> <li>• measure current with ammeter and potential difference with voltmeter</li> <li>• measure time heater is on with a stopwatch</li> </ul> <p><b>Energy calculation:</b></p> <ul style="list-style-type: none"> <li>• calculate power using <math>P = IV</math></li> <li>• calculate energy transferred using <math>E = Pt</math></li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• calculate energy transferred with <math>E = ItV</math></li> </ul> <p><b>Specific heat capacity:</b></p> <ul style="list-style-type: none"> <li>• use equation <math>E = mc\Delta T</math></li> <li>• rearrange to <math>c = E / (m\Delta T)</math></li> <li>• substitute values to calculate c</li> </ul> <p><b>To access level 3, ammeter and voltmeter MUST be mentioned.</b></p>				





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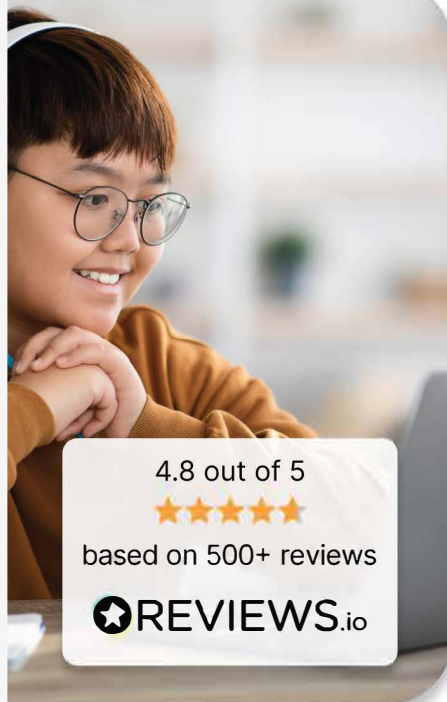
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Question	Answers	Extra information	Mark	Main topic(s) tested
8.1	Rutherford's gold foil experiment	allow alpha scattering experiment	1	Rutherford scattering experiment

8.2	atoms of gold are large and are mostly empty space		1 1	Nuclear model of the atom
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8.3	864 / 432 = 2 half-lives fraction remaining = $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ Mass remaining = $\frac{1}{4} \times 20 = 5$ g	allow 25% remains	1 1 1	Radioactive decay  Half-life
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8.4	gamma radiation high penetration so passes through the body low ionising so causes minimal damage	allow can be detected outside the body / not easily absorbed	1 1 1	Types of radiation (alpha, beta, gamma)
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8.5	Evidence of working on the graph 10 minutes		1 1	Interpreting decay graphs
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8.6	5 minutes = ~1120 20 minutes = 400 Percentage decrease = $\frac{1120 - 400}{1120} \times 100$ = 64%	Allow 1105 – 1160	1 1 1	Radioactive decay calculations
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Question	Answers	Extra information	Mark	Main topic(s) tested
9.1	reduces friction between moving parts	allow smoother movement/ less wear	1	Friction and energy dissipation
	less energy is transferred as heat (wasted)		1	
9.2	trapped air (or gas) between the panes acts as an insulator	allow less energy lost to surroundings/ air is a poor conductor	1	Thermal insulation (conduction & convection)
	reduces heat transfer by conduction		1	
9.3	advantage: renewable/ will not run out	allow low greenhouse gas emissions/ intermittent supply	1	Energy resources (renewable vs non-renewable)
	disadvantage: unreliable/ depends on weather		1	
9.4	any <b>one</b> from: <ul style="list-style-type: none"> <li>• habitat destruction</li> <li>• Pollution</li> <li>• oil spills</li> <li>• loss of biodiversity</li> </ul>		1	Environmental impacts of energy resources



Question	Answers	Extra information	Mark	Main topic(s) tested
10.1	same number of protons different number of neutrons	allow same atomic number/ same element but different masses	1 1	Isotopes

10.2	uranium nuclei split releasing more neutrons these neutrons are <b>absorbed</b> by other uranium nuclei (chain reaction) must be controlled to prevent overheating / explosion	allow control rods absorb neutrons/ regulate reaction rate	1 1 1	Nuclear fission and chain reactions
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10.3	Fission involves a large nucleus splitting, whereas fusion involves small nuclei joining Fission releases neutrons, whereas fusion does not	allow fusion requires very high temperature / fission uses heavy nuclei	1 1	Fission vs fusion
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