

Practice Question Set For GCSE  
**Subject : Physics**  
**Paper-2 Topic : 14\_Particle Model**

Name of the Student: \_\_\_\_\_

Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

Q1.

Question number	Answer	Mark
(i)	<p>An answer that combines the following points of understanding to provide a logical description:</p> <ul style="list-style-type: none"> <li>when steam condenses, its molecules move closer together, so the internal energy decreases (1)</li> <li>when the water from the condensed steam cools, its molecules move more slowly, therefore storing less kinetic energy (1)</li> </ul>	<p>allow as water cools, the distance between the particles decreases which increases the intermolecular forces</p> <p>(2)</p>

Question number	Answer	Additional guidance	Mark
(ii)	<p>equating the variables in the three equations/principle of conservation of energy (1)</p> $(m_w \times l_w) + (m_w \times c_w \times \Delta\theta_w) = (m_m \times c_m \times \Delta\theta_m)$ <p>rearrangement (1)</p> $m_m = \frac{(m_w \times l_w) + (m_w \times c_w \times \Delta\theta_w)}{(c_m \times \Delta\theta_m)}$ <p>substitution of correctly calculated quantities (1)</p> $= \left( \frac{\left( \left( \frac{25}{1000} \right) \times 2260000 \right) + \left( \left( \frac{25}{1000} \right) \times 4200 \times 35 \right) \right)}{3840 \times 60}$ <p>evaluation (1)</p> <p>0.26 (kg)</p>	<p>allow in words or with suitable alternative subscripts</p> <p>temperature changes and <math>l_w</math> must be correct</p> <p>allow maximum of 3 marks for calculations that omit the energy from cooling of water</p>	(4)

Question number	Answer	Mark
(iii)	<p>Any two of the following reasons:</p> <ul style="list-style-type: none"> <li>• more steam must condense and transfer the energy that is dissipated to the jug during the process (1)</li> <li>• more steam must condense and transfer the energy that is dissipated to the surroundings during the process (1)</li> <li>• more steam must condense and transfer the energy needed to cause the milk to froth (1)</li> <li>• more steam must condense to replace any steam that might leave the milk without condensing (1)</li> </ul>	(2)

Q2.

Question number	Indicative content	Mark
*	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p>Procedure</p> <ul style="list-style-type: none"> <li>• Measure the temperature of the boiling water</li> <li>• Allow sufficient time for block to reach temperature of boiling water</li> <li>• Measure temperature of cold water in beaker</li> <li>• Using a thermometer</li> <li>• Transfer (hot) aluminium block to cold water in the beaker.</li> <li>• Work quickly to avoid thermal energy loss during transfer</li> <li>• Measure temperature of water</li> <li>• Stir to ensure even distribution</li> <li>• Measure maximum temperature reached by water</li> <li>• Calculate temp rise of water by subtracting initial from final temperature.</li> <li>• Calculate temp drop of aluminium by subtracting final temperature from 100.</li> <li>• Find mass of beaker and water and aluminium</li> <li>• Use a balance</li> <li>• Empty water from beaker and dry beaker and block</li> <li>• Weigh beaker and block alone</li> <li>• Find mass of water by subtraction.</li> <li>• Allow plausible method of finding mass of water before putting block in.</li> </ul>	(6) AO2 and AO3

	<p>Process results</p> <ul style="list-style-type: none"> <li>• Calculate thermal energy gained water using <math>\Delta Q = m \times c \times \Delta\theta</math></li> <li>• Thermal energy gained by water = thermal energy lost by aluminium</li> <li>• Specific heat capacity of aluminium =</li> </ul> $\frac{\text{thermal energy transferred}}{\text{mass of Al} \times \text{temp drop of Al}}$	
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Level	Mark	Descriptor
	0	<ul style="list-style-type: none"> <li>• No awardable content</li> </ul>
Level 1	1-2	<ul style="list-style-type: none"> <li>• The plan attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. (AO2)</li> <li>• Analyses the scientific information but understanding and connections are flawed. An incomplete plan that provides limited synthesis of understanding. (AO3)</li> </ul>
Level 2	3-4	<ul style="list-style-type: none"> <li>• The plan is mostly supported through linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. (AO2)</li> <li>• Analyses the scientific information and provides some logical connections between scientific enquiry, techniques and procedures. A partially completed plan that synthesises mostly relevant understanding, but not entirely coherently. (AO3)</li> </ul>
Level 3	5-6	<ul style="list-style-type: none"> <li>• The plan is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made between elements in the context of the question. (AO2)</li> <li>• Analyses the scientific information and provide logical connections between scientific concepts throughout. A well-developed plan that synthesises relevant understanding coherently. (AO3)</li> </ul>

Summary for guidance			
Level	Mark	Additional Guidance	General additional guidance – the decision within levels
	0	No rewardable material.	e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
Level 1	1-2	<u>Additional guidance</u> Partially complete description of a suitable procedure with at least one measurement	<u>Possible candidate responses</u> Heat up the block in the boiling water. Then put the block into the cold water. Measure the temperature reached by the water.
Level 2	3-4	<u>Additional guidance</u> Mostly complete description of a suitable procedure with at least two measurements and some description of processing the results.	<u>Possible candidate responses</u> As above with Measure mass of water. Use $\Delta Q = m \times c \times \Delta\theta$ to find thermal energy transferred
Level 3	5-6	<u>Additional guidance</u> Detailed description of a suitable procedure with most of the necessary measurements and a clear description of processing the results.	<u>Possible candidate responses</u> As above with Calculate temperature changes by subtraction. Calculate thermal energy lost by Al as being equal to thermal energy gained by water.  Specific heat capacity of Al = $\frac{\text{thermal energy transferred}}{\text{mass of Al} \times \text{temp drop of Al}}$

Q3.

Question Number	Answer	Additional guidance	Mark
	<p>A description including:</p> <p>find mass of marble(s) (1)</p> <p>put marble(s) into water (in cylinder) and measure <b>change</b> in water level (1)</p> <p>divide mass by volume (1)</p> <p>suitable idea to improve accuracy such as use several marbles (1)</p>	<p>weigh marble(s)</p> <p>accept volume for water level note level before and after marble(s) added</p> <p>find <b>volume</b> of water displaced</p> <p>density = mass/volume in words or symbols</p> <p>subtract mass of bag from total mass of marbles and bag</p> <p>ensure water measured at eye level</p> <p>use appropriately sized measuring cylinder</p> <p>ignore reference to repeating and taking average</p>	<p>(4)</p>

Q4.

Question number	Answer	Additional guidance	Mark
	<p>descriptions to include any <b>two</b> of</p> <p>particles / atoms in solid close(r) together (1)</p> <p>particles / atoms in solid (vibrate) in fixed positions but particles in liquid move (freely) (1)</p> <p>particles in a solid in regular arrangement but particles in liquid are randomly arranged (1)</p> <p>particles in a liquid have more (kinetic) energy (than in a solid) (1)</p>	<p>reverse argument</p> <p>difference asked for so <b>must compare</b> for subsequent marking points</p> <p>allow answers in terms of forces between particles</p>	<p>(2) AO1</p>