Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
(i)	rearrangement (and substitution) (1) (c) $= \frac{1050}{0.058 \times 78}$ evaluation (1) 230 (J/kg °C)	$c = \frac{\Delta Q}{m \times \Delta\theta}$ award 1 mark if 78 seen accept 232(J/kg °C) award full marks for correct answer without working.	**(2)**

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Question number	Answer	Additional guidance	Mark
(ii)	any two of the following reduce heat loss from water/insulate beaker/add cover (1) make the temperature rise larger/use a larger piece of copper/ use a smaller amount of water (1) (use)a stirrer (1) account for heat gained by glass beaker (1) transfer the hot copper faster (1) use a different heating method (1) measure the temperature of the boiling water (1)	ignore more accurate measurements e.g. thermometer, balance etc. ignore taking repeats start with colder water	(2)

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Q2.

Question number	Indicative content	Mark
*	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. 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. Fibre glass • has lower R-value • similar R-value (to polystyrene) • derived from sand so plentiful / cheap • non-flammable • dangerous to install • concludes / uses other arguments to say that it is a suitable or unsuitable material	**(6)** **AO2, AO3**
	Polystyrene • high(est) R-value so suitable on that score • (but) involves petroleum / oil extraction so (could be) environmentally damaging • melting / flammable / fire hazard / release of toxic fumes • concludes / uses other arguments to say that it is a suitable or unsuitable material	

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Level	Mark	Descriptor
	0	• No awardable content
Level 1	1–2	• Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

Level	**Mark**	**Additional Guidance**	**General additional guidance – the decision within levels** 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.
	0	No rewardable material.	
Level 1	1–2	Additional guidance at least two pieces of information from the table used OR one piece of information on the table and makes a simple choice	Possible candidate responses R is 4.0 for polystyrene + fibreglass is not flammable OR we should use fibreglass

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Level 2	3–4	Additional guidance compares at least two properties OR compares one property and gives a conclusion about suitability uses information from the two materials used AND makes some comparison(s) / concludes logically about suitability	Possible candidate responses fibreglass has a lower R-value and is not flammable, but polystyrene is OR fibreglass is not flammable, but polystyrene is, so fibreglass better
Level 3	5–6	Additional guidance compares at least two properties AND gives a conclusion (both materials involved, allow one to be discussed in greater detail than the other) WITH logical connections between elements argued from the table.	Possible candidate responses fibreglass and polystyrene have similar R-values. Fibreglass is not flammable, but polystyrene is, so fibreglass is better

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Q3.

Question Number	Answer	Additional guidance	Mark
(i)	29(g)		(1)

Question Number	Answer	Additional guidance	Mark
(ii)	25(cm^3)		(1)

Question Number	Answer	Mark
(iii)	**D** density = $\frac{\text{mass}}{\text{volume}}$ **D** is the only correct answer **A** is incorrect because the equation density =mass**+** volume is incorrect **B** is incorrect because the equation density =mass – volume is incorrect **C** is incorrect because the equation density =mass x volume is incorrect	(1)

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Question Number	Answer	Additional guidance	Mark
(iv)	Any two improvements from:		(2)
	use balance that reads to one or more decimal places/more decimal places (1)	Accept use more accurate/precise balance in this context	
	use tare/zero balance for first measurement (1)	Allow reset for tare	
	use measuring cylinder with smaller divisions (1)	Allow more accurate/ different scale / different divisions / thinner measuring cylinder	
	use larger volume of liquid (1)	Allow use more liquid / larger mass of liquid	
	repeat and average (1)		
	read measuring cylinder at eye level (1)	Allow avoid parallax error / read from bottom of meniscus	

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Q4.

Question number	Answer	Additional guidance	Mark
(i)	933 (K) (1)	do not accept -933	**(1)** **AO2**

Question number	Answer	Additional guidance	Mark
(ii)	A description to include any **two** from: (motion is) random (1) various {speeds / velocities / kinetic energies} (1) bump into each other / collide (1)	 move freely / move in any direction / move around different speeds range of speeds slide over / past each other / touch each other / in contact with each other	**(2)** **AO1**
	fast(er than solid) (1)	more kinetic energy (than in solid) ignore bulk properties of liquids e.g. take shape of container. ignore vibrate "random speeds" on its own scores 1 mark	

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Q5.

Question	Answer	Additional guidance	Mark
	substitution into $Q = m \times L$ (1) (Q =) 60 ($\times 10^{-3}$) $\times$ 2.26 ($\times 10^{6}$) evaluation (1) 1.36×10^{5} (J)	 136 000 (J) 135 600 (J) accept numbers that round to 1.4×10^{5} (J) award full marks for the correct answer without working any answer rounding to 1.4 to any other power of 10 scores 1 mark	**(2)** **AO2.1**

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Q6.

Question number	Answer	Additional guidance	Mark
(i)	an explanation linking any three of the following : use a measuring cylinder /beaker or use a eureka can /displacement can/container with spout (1) (partly) fill measuring cylinder /beaker (with water) note the reading or fill (eureka) can to spout (1) immerse piece of copper (in water) (1) note difference in readings of water level (in measuring cylinder /beaker) or collect water from spout in a measuring cylinder /beaker (1)	give credit for other acceptable methods If no other marks scored then allow 1 mark for attempt to measure volume directly: e.g. fill copper tube with water, tip out and measure volume or measure dimension(s) of copper tube	(3)

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Question number	Answer	Additional guidance	Mark
(ii)	recall and substitution (1) density= $\frac{m}{V}$ (density=) $\frac{0.058}{6.5\ (\times 10^{-6})}$ evaluation (1) 8.9×10^{3} (kg/m^3)	 accept values that round to 8900 e.g. 8923(kg/m^3) or 9000 8.9 to any other power of ten gains 1 mark award full marks for correct answer without working.	(2)

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