Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

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. Equipment • Thermometer • Measuring cylinder / balance • Power supply • Stirrer • Joule meter / ammeter / voltmeter • Stopwatch / clock Measurements • Mass / volume of water • Initial / final / change of temperature of water • Voltage / current / energy / power • Time (heated for) Detail • Lid/insulation to reduce energy loss • Ensure heater fully immersed / keep stirring the water • Use of equation $\Delta Q = m \times c \times \Delta\theta$ / calculation of input energy • Repeat and find average • Plot graph of temp change and time / energy Credit can be given for correctly labelled diagrams	**(6)** **AO1**

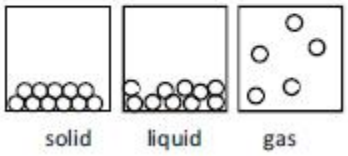
Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1) • Presents a description which is not logically ordered and with significant gaps. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1) • Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1) • Presents a description that has a well-developed structure which is clear, coherent and logical. (AO1)

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 one measurement **or** two items of equipment **or** one piece of detail	Possible candidate responses measure the temperature of the water to start with **or** the student needs a power supply and a thermometer **or** insulated material around the beaker
Level 2	3–4	Additional guidance two items of equipment and at least one measurement **or** one piece of equipment and two measurements **or** two items of equipment and one piece of detail **or** one measurement and one piece of detail	Possible candidate responses The student needs a measuring cylinder to measure the volume of water. They also need a thermometer **Or** Measure the temperature rise of the water and use a balance to measure the mass **or** They need a power supply for the heater and a voltmeter. Keep the heater in the water. **or** Measure temperature rise of the water. Keep stirring the water all the time.
Level 3	5–6	Additional guidance two items of equipment and two measurements and one piece of detail.	Possible candidate responses The student needs a balance to find the mass of water. They also need a thermometer to measure the rise in temperature of the water. Then use the equation $\Delta Q = m \times c \times \Delta\theta$

Q2.

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

Q3.

Question number	Answer	Additional guidance	Mark
	In the solid box: regular arrangement and particles touching (1) In the liquid box: irregular arrangement and most particles touching (1) In the gas box: random and spaced (compared to liquid) (1)	ignore variation in particle size ignore arrows/lines indicating movement allow solid and liquid arrangements that do not fill the box  	(3)

Q4.

Question	Answer	Additional guidance	Mark
	an explanation linking: density of solid is greater (than density of liquid) (1) (because) distance between particles in solid is less (than distance between particles in liquid) (1)	 solids are dens**er** accept in solids, particles are clos**er** accept in solids, there are **more** particles per unit volume / particles are **more** (tightly) packed	**(2)** **AO1.1**

Q5.

Question number	Answer	Additional guidance	Mark
	an explanation linking density of wood less (than that of water) (1) less (volume of) water displaced (than volume of wood) (1)	 allow wood floats / should be submerged allow wood absorbing water allow (idea of) incorrect volume reading allow (idea that) the volume cannot be measured this way	**(2)** **AO2**

Q6.

Question Number	Answer	Mark
	A melting **A** is the only correct answer. **B** is incorrect because the change from solid to liquid is not freezing. **C** is incorrect because the change from solid to liquid is not evaporation. **D** is incorrect because the change from solid to liquid is not condensation.	**(1)**

Q7.

Question Number	Answer	Acceptable answers	Mark
(a)	B do not move at absolute zero		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	An explanation linking: • particles move / collide (1) with • the walls of the syringe (1) 2nd mark dependent on first	hit/strikes/bounces ignore vibrate with the syringe 'hits the syringe' = 2 marks ignore 'push against the syringe'	**(2)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	323K (1) Volume/ml | Temperature/°C | Temperature/K 6 | 0 | 273 6.5 | 25 | 298 7.1 | 50 | **323** 7.6 | **75** | 348 8.2 | 100 | 373		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(iii)	A description including: • V increases as T increases (or reverse) / there is a positive correlation (1) • proportional / goes up in equal steps / constant increase (1)	hotter leads to greater volume / cooler leads to smaller volume do not allow 'as heat rises' accept a doubling argument for the second mark.(Ignore readings taken from graph if not supporting doubling.) volume is (directly) proportional to temperature for 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	• Substitution $\frac{6.5 \times 450}{298}$ (1) • evaluation 9.8 (ml) (1)	Any answer between 9.8(ml) and 9.9(ml) (ignore dp / rounding off) Accept answer with no working for full marks	**(2)**

(Total for Question = 8 marks)