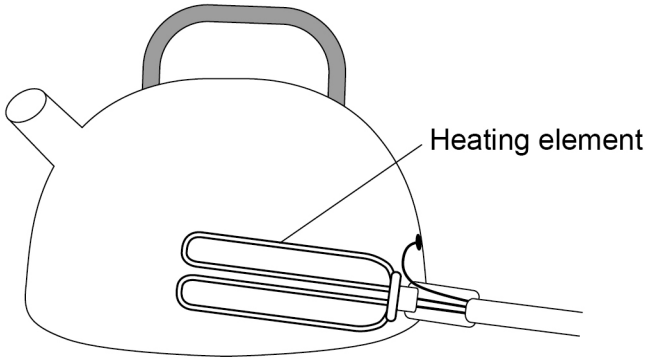
Do not write outside the box

0 5 A student investigated how the mass of water in an electric kettle affected the time taken for the water to reach boiling point.

The kettle switched off when the water reached boiling point.

Figure 4 shows the kettle.

Figure 4



0 5 . 1 The heating element of the kettle was connected to the mains supply.

Explain why the temperature of the heating element increased.

[2 marks]

0 5 . 2 Give **one** variable that the student should have controlled.

[1 mark]

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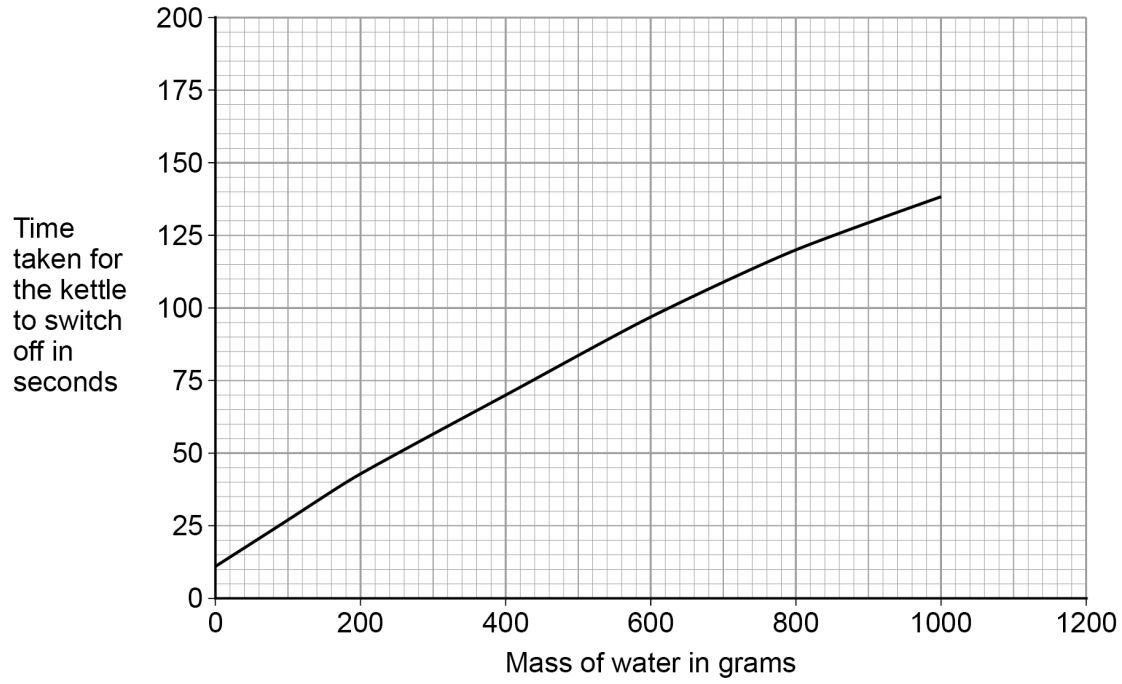
Figure 5 shows how the mass of water in the kettle affected the time taken for the kettle to switch off.

Figure 5



0 5 . 3 Suggest why the line on **Figure 5** does **not** go through the origin.

[1 mark]

0 5 . 4 Suggest why the results give a non-linear pattern.

[1 mark]

Question 5 continues on the next page

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0 5 . 5 The power of the kettle was 2.6 kW

The kettle took 120 seconds to heat 0.80 kg of water from 18 °C to 100 °C

Calculate the specific heat capacity of water using this information.

Give your answer to 2 significant figures.

[6 marks]

Specific heat capacity = _____ J/kg °C

11

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
05.1	electrons collide with particles in the heating element which increases the (kinetic) energy of the particles (in the heating element)	allow there is a current in the heating element allow internal store of energy increases allow the particles (in the heating element) vibrate more rapidly	1 1	AO1.1 6.2.4.2 6.3.2.1 WS 1.2	E
05.2	the starting temperature of the water	allow the starting temperature of the kettle	1	AO3.3a 6.2.4.2 WS 2.2	E
05.3	(the heating element of) the kettle took time to heat up		1	AO3.1a 6.2.4.2 WS 3.7	E
05.4	the (rate of) energy transfer (per kg of water) to the surroundings decreases as the mass of water increases **or** the efficiency of the kettle increases as the mass of water increases	allow the (rate of) energy transfer (per kg of water) to the surroundings changes as the mass of water changes allow the efficiency of the kettle changes as the mass of water changes	1	AO3.1b 6.2.4.2 WS 3.7	E

05.5		an answer of 4800 (J/kg °C) scores **6** marks a correct answer given to more than 2 s.f. scores **5** marks		AO2.1 6.3.2.2 6.1.1.3 6.1.1.4 WS 3.3	E
	E = 2600 × 120	allow a correct substitution of an incorrectly/not converted value of P and/or t.	1		
	E = 312 000 (J)	this answer only the equation E=Pt must have been used to score subsequent marks.	1		
	312 000 = 0.80 × c × (100-18) **or** 312 000 = 0.80 × c × (82)	allow use of their value of E calculated using E =Pt for this and subsequent steps	1		
	$c = \frac{312\,000}{0.80 \times 82}$		1		
	c = 4 756		1		
	c = 4 800 (J/kg °C) (2 s.f.)	this mark can only be scored for a correct rounding of a value of c calculated using correct equations	1		

Total			**11**