3 An electric heater is used to heat some water.

Figure 8 shows the experimental setup used.

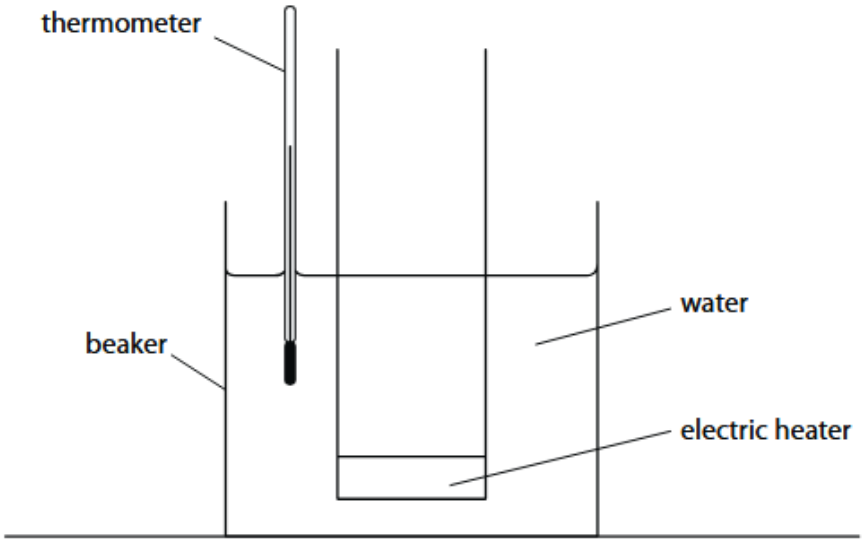

Figure 8

(a) Figure 9 shows the energy transferred by the electric heater in 1 second.

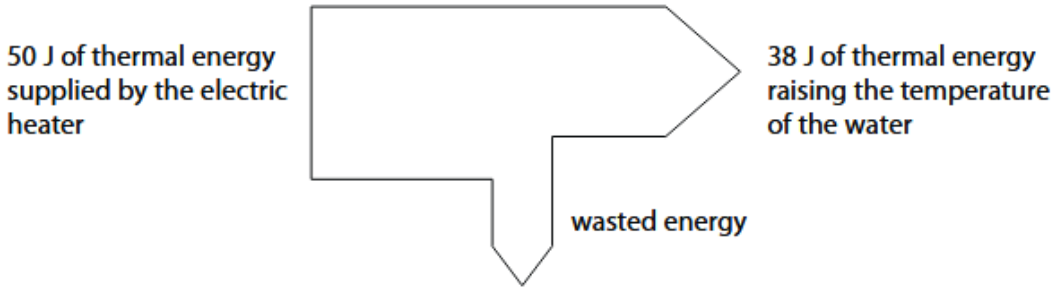

Figure 9

(i) How much energy is wasted each second?

(1)

☒ **A** 12 J

☒ **B** 38 J

☒ **C** 50 J

☒ **D** 88 J

(ii) Describe what happens to the wasted energy.

(2)

(b) Explain **one** way the experiment can be improved to reduce the amount of wasted energy.

(2)

(c) The initial mass of the water in the beaker is 0.72 kg.

The electric heater is switched on for some time and the water boils.

The mass of the water after the heater is switched off is 0.60 kg.

The thermal energy transferred to the water while it boils is 270 000 J.

Use an equation from the formula sheet to calculate the specific latent heat of the water.

(3)

specific latent heat = ... J/kg °C

(Total for Question 3 = 8 marks)

Question number	Answer	Mark
3(a)(i)	A	(1)

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An answer that provides a description by making reference to: • thermal/heat energy (1) • dissipated in/transferred to air/surroundings (1)	allow heat 'lost' to surroundings	(2)

Question number	Answer	Additional guidance	Mark
3(b)	An explanation that combines identification – improvement of the experimental procedure (1 mark) and justification/reasoning which must be linked to the improvement (1 mark): • place the beaker on an insulator (1) • so this (material) will reduce rate of energy transfer (1) or • wrap the beaker in an insulator (1) • so this (material) will reduce the rate of energy transfer (1) or • reduce the surface areas of the water (1) • to give less evaporation (1)	allow named insulator, e.g. cork mat put a lid on the beaker/make the beaker taller and narrower	(2)

Question number	Answer	Additional guidance	Mark
3(c)	rearrangement (1) $(l =) \frac{\Delta Q}{\Delta m}$ substitution (1) $l = \frac{270\,000}{0.12}$ answer (1) 2 250 000 (J/kg °C)	award full marks for correct numerical answer without working 2250 (J/kg °C) gains 2 marks as power of 10 error	(3)