

**GCSE Physics B (Twenty First Century Science)**  
**J259/02** Depth in physics (Foundation Tier)

**Question Set 30**

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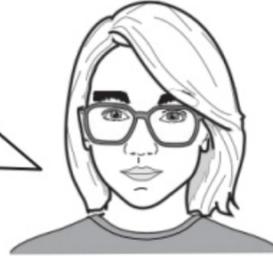
Water is used as a coolant in heating systems because it has a high specific heat capacity.

Nina does an experiment to find the specific heat capacity of water, by heating 1 kg of water in a 2.4 kW kettle.

The kettle takes several minutes to heat the water to its boiling point.

**Nina**

I can use a balance to accurately measure the 1 kg mass of water in the kettle.



- (a) State **two** other pieces of equipment that Nina needs to use in her experiment. [2]

Thermometer and stopwatch

- (b) The 2.4 kW kettle takes 3 minutes to heat the water from room temperature to boiling point.

Calculate the total energy supplied by the kettle.

Use the equation: energy = power × time

$$E = 2400 \times 180 = 432,000 \text{ J}$$

Energy = 432,000 J [4]

- (c) The useful energy transferred to heat the water from room temperature (20°C) to boiling point, 100°C is 345 600 J.

- (i) Calculate the efficiency of the kettle.

Use your answer to (b).

Use the equation:

efficiency = useful energy transferred ÷ total energy transferred

$$\frac{345600}{432000} = 0.8$$

Efficiency = 0.8 [2]

- (ii) Calculate the specific heat capacity of the water from Nina's experiment.

Use the equation:

change in internal energy = mass × specific heat capacity × change in temperature

$$c = \frac{E}{m\Delta T} = \frac{345600}{1 \times 80} \text{ Specific heat capacity} = 4320 \text{ J/kg}^\circ\text{C} [2]$$
$$= 4320 \text{ J/kg}^\circ\text{C}$$

- (d) (i) Suggest why the energy **supplied** by the 2.4kW kettle is more than the energy **transferred** to the 1 kg of water.

[1]

Energy is lost as heat to the surroundings.

- (ii) Suggest **one** way in which the experiment to find the specific heat capacity of water could be improved.

[1]

Add in solution

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