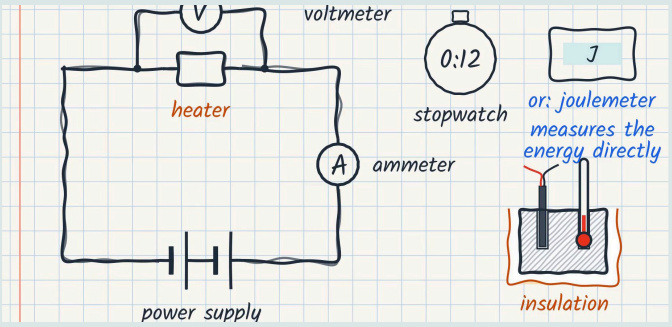
# Required practical: specific heat capacity

*Measuring c for a metal block*

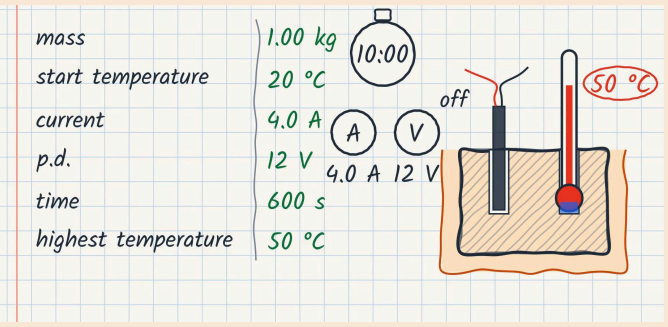
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Summary sheet

## 1 The kit




- An **aluminium block** (known mass) with two holes: one for an **electric heater**, one for a **thermometer**.
- Measure the energy with an **ammeter**, a **voltmeter** and a **stopwatch**, or with a **joulemeter**. Wrap the block in **insulation**.

## 2 The method




- Measure the mass. Put a **drop of water** in the thermometer hole so it reads the block's temperature properly.
- Record the start temperature, switch on and start timing, note I and V. After 10 min switch off and record the **highest** temperature.

## 3 The calculation

$\Delta E = 28\,800\ J \cdot m = 1.00\ kg \cdot \Delta\theta = 30\ °C$

$\Delta E = m\ c\ \Delta\theta$

$c = \Delta E \div (m \times \Delta\theta)$

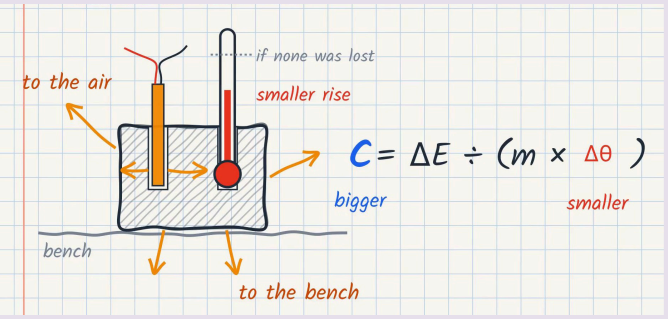
$c = 28\,800 \div (1.00 \times 30)$

$c = 960\ J/kg\ °C$

*c = energy in ÷ (mass × temperature change)*

- Energy: P = V × I = 12 × 4.0 = 48 W, then E = P × t = 48 × 600 = 28 800 J
- c = ΔE ÷ (m × Δθ) = 28 800 ÷ (1.00 × 30) = 960 J/kg °C

## 4 Why it's off, and how to improve




- Energy is **transferred to the surroundings**, so Δθ is smaller and the calculated c is **too high**.
- Improve: more insulation (including the top), a good fit with a drop of water, use the highest temperature. **Hazard**: hot block and heater, so don't touch; let them cool.

## $c = \Delta E \div (m\ \Delta\theta)$

*specific heat capacity = energy supplied ÷ (mass × temperature change)*

| | | |
|---|---|---|
| $\Delta E$ | energy supplied (E = P t, P = V I) | joule (J) |
| $m$ | mass | kilogram (kg) |
| $c$ | specific heat capacity | J/kg °C |
| $\Delta\theta$ | temperature change (highest − start) | degree Celsius (°C) |

*From ΔE = m c Δθ, which is on the equation sheet*

**Exam tip**

Asked why the value is too high? Give the full chain: energy is transferred to the surroundings, so the temperature rise is smaller, so the calculated value is bigger.

## Check yourself

1. Why does a drop of water go in the thermometer hole?
2. A 2 kg block gets 36 000 J and warms by 20 °C. What is c?

Answers: 1. So the thermometer reads the block's temperature properly. 2. c = 36 000 ÷ (2 × 20) = 900 J/kg °C