



QUESTION WORKBOOK

Thermal energy transfer and specific heat capacity

Thermal physics · Year 13

AQA 3.6.2.1 · CIE 14.1, 14.3, 16.1, 16.2 · OCR A 5.1.1, 5.1.2, 5.1.3

10 questions · 30 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 Define the internal energy of a substance. [2]

A2 Calculate the energy needed to raise the temperature of 0.50 kg of water by 20°C (specific heat capacity of water = 4200 J kg⁻¹ K⁻¹). [2]

A3 Explain why the temperature of a substance stays constant while it changes state, even though energy is being supplied. [2]

SECTION B · Standard

B1 Calculate the energy needed to heat 2.0 kg of a metal (specific heat capacity 900 J kg⁻¹ K⁻¹) from 20°C to 70°C. [3]

- B2** Calculate the energy needed to melt 0.30 kg of ice at its melting point (specific latent heat of fusion = $3.34 \times 10^5 \text{ J kg}^{-1}$). [4]

- B3** Supplying 5000 J of energy raises the temperature of a 0.20 kg block by 25°C . Calculate the specific heat capacity of the block. [3]

- B4** A 2.0 kW heater warms 1.5 kg of water by 30°C ($c = 4200 \text{ J kg}^{-1} \text{ K}^{-1}$). Assuming no losses, calculate the time taken. [3]

SECTION C · Stretch

- C1** Calculate the total energy needed to turn 0.20 kg of ice at 0°C into water and then warm it to 20°C (latent heat of fusion = $3.34 \times 10^5 \text{ J kg}^{-1}$, $c_{\text{water}} = 4200 \text{ J kg}^{-1} \text{ K}^{-1}$). [4]

- C2** 0.10 kg of water at 80°C is mixed with 0.20 kg of water at 20°C. Assuming no energy is lost to the surroundings, calculate the final temperature. [4]

- C3** Explain the difference between heating and doing work as ways of increasing the internal energy of a gas. [3]