Heating: Specific Heat Capacity and Latent Heat

Energy and matter · 4 questions · step-by-step answers at the end

Name: Date: Score: / 4

USEFUL EQUATIONS

$\Delta E = mc\Delta\theta \quad E = mL$

Questions

Show your working in the space under each question.

1. A 0.50 kg aluminium block (c = 900 J/kg °C) receives 9000 J. Find its temperature rise.

2. How much energy is needed to heat 2.0 kg of water from 20 °C to 100 °C, and then to boil away 0.50 kg of it? (c = 4200 J/kg °C, L = 2.26×10^6 J/kg)

3. How much energy is needed to melt 0.20 kg of ice at 0 °C? (L = 334 000 J/kg)

4. Why does steam at 100 °C cause a worse burn than water at 100 °C?

Step-by-step answers

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1. $\Delta\theta = E/(mc) = 9000/(0.50 \times 900) =$ **20 °C**.

2. 1. Heating: $\Delta E = mc\Delta\theta = 2.0 \times 4200 \times 80 =$ **672 000 J**.
2. Boiling: $E = mL = 0.50 \times 2.26 \times 10^6 =$ **1 130 000 J**.
3. Boiling a quarter of the water takes more energy than heating all of it by 80 °C.

Answer: 0.67 MJ, then 1.13 MJ

3. $E = mL = 0.20 \times 334\,000 =$ **66 800 J**.

4. The steam also releases its **latent heat** as it condenses on the skin, before it cools as water.