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WORKSHEETS
ATTEMPT | CHECK | CORRECT | IMPROVE

AQA GCSE Physics 8463 | Energy changes in systems worksheet

35–40 minutes independent practice + 15–20 minutes review

Specification points covered

- 4.1.1.3 — calculate a thermal energy change using ΔE = mcΔθ and define specific heat capacity.
- Required practical activity 1 — determine the specific heat capacity of one or more materials.
- 4.1.1.3 — link energy transferred by work to an increase in a thermal energy store.

How to use this worksheet

Attempt every question independently. Show working, use correct units, and be ready to check and improve your answers in the class review.

1. Specific heat capacity
(a) State what is meant by the specific heat capacity of a substance. [2]
(b) Give its SI unit. [1]
Starter: include the mass and temperature change in the definition.

2. A factory heats a 2.5 kg aluminium thermal-store block from 18 °C to 65 °C. The specific heat capacity of aluminium is 900 J kg^{-1} °C^{-1}.
(a) Calculate the temperature change. [1]
(b) Calculate the energy transferred to the block. [4]
Develop: write ΔE = mcΔθ, substitute, then give a final answer with a unit.

3. A student is given a metal block with holes for an electric heater and a thermometer. Describe a method to determine the specific heat capacity of the metal. The heater power is known. [5]

Develop: include measurements, energy input, temperature change, the calculation and one control against energy loss.

4. A 1.20 kg test block is heated by a 48 W heater for 300 s. Four measurements of its temperature change are shown in the table.
(a) Identify the anomalous result and suggest one plausible measurement problem. [2]
(b) Calculate the mean temperature change using only the valid results. [2]
(c) Calculate the electrical energy supplied by the heater. [2]

Trial	Temperature change / °C
1	14.8
2	15.1
3	4.2
4	15.0

Apply: reject an anomaly only when the other values form a clear pattern.

5. Use the valid data from Question 4 to calculate the specific heat capacity of the test block. Give your answer to three significant figures. [3]

Apply: use $c = E/(m\Delta\theta)$ with your mean temperature change.

6. The manufacturer states that the block has a specific heat capacity of 900 J kg^{-1} °C^{-1}, higher than the student's result. Suggest one measurement problem that could make the calculated value too low. Explain the direction of the effect. [3]

Connect: identify which measured quantity is too large or too small, then trace it through c = E/(mΔθ).

7. A food company compares two 5.0 kg thermal-store blocks. Block A has c = 500 J kg^{-1} °C^{-1} and block B has c = 1000 J kg^{-1} °C^{-1}. Each block receives 100 kJ.
(a) Calculate the temperature rise of each block. [4]
(b) The company wants the block whose temperature changes least while absorbing energy. Choose a block and justify your answer. [2]

Challenge: rearrange the equation separately for each material, keeping joules and kilojoules consistent.

8. A sealed mixer does 36 kJ of work on 2.0 kg of oil. The oil has c = 1800 J kg^{-1} °C^{-1} and no energy leaves the system.
(a) Calculate the temperature rise of the oil. [3]
(b) Name the energy-transfer pathway and the store that increases. [1]

Check: connect mechanical work to the thermal energy change before calculating.

Review and improve

- I can define specific heat capacity and use its unit.
- I can plan and evaluate the AQA specific heat capacity practical.
- I can calculate and interpret ΔE = mcΔθ in an unfamiliar system.