physicsUK
Smarter practice. Stronger understanding

WORKSHEETS
ATTEMPT | CHECK | CORRECT | IMPROVE

AQA GCSE Physics 8463 | Energy transfers in a system worksheet

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

Specification points covered

- 4.1.2.1 — use conservation of energy and describe dissipation in closed and open systems.
- 4.1.2.1 — explain how insulation and thermal conductivity affect unwanted energy transfers.
- Required practical activity 2 — investigate the effectiveness of thermal insulators.

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. Energy in systems
(a) State the principle of conservation of energy. [2]
(b) State what is meant by a closed system. [1]
Starter: distinguish energy being transferred from energy being created or destroyed.

2. Hot soup is placed in an uninsulated delivery container and cools during a journey. Describe the energy changes for the soup, container and surroundings. [4]
Develop: name the decreasing and increasing stores, the transfer mechanism and what 'dissipated' means.

3. Container walls are available in the same material but in different thicknesses.
(a) Explain what is meant by a material having low thermal conductivity. [2]
(b) Explain why a thicker wall reduces the rate of unwanted energy transfer. [2]
Develop: connect a material property and wall thickness to the rate of transfer.

4. Plan an investigation to compare the effectiveness of different insulation thicknesses around identical food containers. You may use hot water instead of soup. [6]
Apply: identify the independent and dependent variables, controls, measurements, repeats and a suitable comparison.

5. Each container starts at 80 °C. The final temperatures after 20 minutes are shown.
(a) Calculate the temperature drop for 10 mm foam. [1]
(b) Calculate its mean cooling rate in °C per minute. [2]
(c) Identify the lining that gives the lowest energy-transfer rate. [1]
(d) Explain which two results give the fairest test of the effect of foam thickness. [2]

Lining	Final temperature / °C
None	61
5 mm foam	69
10 mm foam	73
10 mm wool	71

Apply: use temperature drop per unit time and compare only one changed variable.

6. The final-temperature test for 10 mm foam is repeated four times.
(a) Identify the anomalous result. [1]
(b) Calculate the mean of the valid results. [2]
(c) Explain why repeats and a mean improve the evidence. [1]

Repeat	Final temperature / °C
1	73
2	72
3	61
4	74

Connect: remove an anomaly only when the remaining repeats are consistent.

7. A cycle-delivery company requires the soup to remain above 70 °C after 20 minutes. A 10 mm foam liner finishes at 73 °C, costs £1.10 and has mass 180 g. A 10 mm wool liner finishes at 71 °C, costs £0.75 and has mass 120 g. A reflective liner has no test data. Recommend a liner for the company and justify your choice. [5]
Challenge: apply the temperature requirement, then weigh thermal performance, mass, cost and evidence quality.

8. The factory conveyor that seals the containers has hot, noisy bearings. Explain how lubrication could improve the efficiency of the conveyor without breaking the principle of conservation of energy. [4]
Check: link friction, unwanted transfer, useful transfer and conservation.

Review and improve

- I can describe energy conservation and dissipation using stores and pathways.
- I can plan and evaluate the AQA thermal-insulation practical.
- I can use evidence to select insulation for a real constraint.