Thermal review: transfer and temperature

Student activity • observation and reasoning

YEAR 11 / LESSON 72 / PHYSICS + SCIENCE (DOUBLE AWARD)

The question

Can you distinguish energy transfer, temperature and a change of state?

Use common thermal-transfer concepts, with clearly marked additional tasks for the separate Physics course.

Equipment

- Booklet, original thermal diagrams and calculator for the optional task

Desk-based review. No hot drinks, heaters, ice or hot-water baths are needed.

Course coverage: Shared Physics / Double Award: Shared energy-transfer review; particle-state and specific-heat tasks are Physics-only extensions.

Plan, model or apparatus sketch

Draw the apparatus or model and label the measured quantities and their units.

Method and reasoning

Read the whole sequence before starting

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1. Draw a warm drink cooling in a room and identify conduction through its cup, convection in surrounding fluid and infrared transfer. Explain the overall direction of net energy transfer.

2. Explain how a lid and insulation can reduce different pathways. State why insulation slows cooling rather than guaranteeing an unchanged temperature.

3. Compare a metal and wooden handle initially at the same room temperature. Explain why touch alone is not a reliable temperature measurement.

4. Physics-only extension: use a melting-ice graph to explain a near-constant-temperature interval. Double Award alternative: explain why moving air can change the cooling rate of a warm object.

5. Physics-only extension: find energy for m = 0.40 kg, c = 900 J kg^{-1} $°C^{-1}$ and ΔT = 10 °C. Double Award alternative: draw an energy-transfer diagram and explain why efficiency cannot exceed 100% in a consistent account.

6. Correct one explanation using evidence from an earlier activity. Keep the specific-heat and state-change extensions separate from shared assessment prompts.

Cleanup

- Return cards and retain corrections.

Record your evidence

Blank spaces are for your own work

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Reference and task data

This is a mixed-course review with alternatives. The separate-course calculation gives 3600 J. A cooling curve is not necessarily linear: net transfer usually changes as the temperature difference changes.

Shared task	Explanation	Correction
Cooling pathways		
Insulation		
Touch and temperature		
Energy conservation		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Which direction is net thermal transfer for a warm drink in a cooler room?

2. What does insulation do?

3. Can touch reliably compare temperatures of different materials?

4. Why does a lid reduce cooling?

5. Does energy disappear when a drink cools?

6. Why might the cooling rate slow?