

Thermal energy transfers · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Thermal · 1.1

Reasoning

Two equal masses receive the same energy but show different temperature rises. Material properties determine how energy transfer changes temperature. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Thermal · 2.1

Reasoning

Specific heat capacity is energy needed to raise the temperature of unit mass by one degree. Specific latent heat relates energy to change of state without temperature change for the idealized process. specific heat capacity: Energy per mass per temperature rise; latent heat: Energy associated with a change of state.

Thermal · 3.1

Reasoning

Temperature relates to particle motion in a model; internal energy includes kinetic and potential contributions. During a change of state, energy can change particle arrangements rather than temperature. Measure mass, electrical input and temperature change for an insulated block. Ensure the temperature sensor has good contact, allow time for equilibration, and consider energy transferred to the surroundings.

Thermal · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: a 0.50 kg block gains 2,000 J and rises 10 °C. Use $E = mc\Delta T$. Rearranging gives $c = E/(m\Delta T)$. $c = 2,000/(0.50 \times 10) = 400$ J per kilogram per degree. Heat loss would make the value inferred from electrical input too large.

Thermal · 4.2

Reasoning

A 2 kg sample with $c=500$ J per kilogram per degree warms by $3\text{ }^{\circ}\text{C}$. Find energy gain.
Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Thermal · 5.1

Reasoning

A flat section of a heating curve can show a phase change, not absence of energy transfer. Do not substitute temperature for a temperature difference in $E = mc\Delta T$. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Thermal · 5.2

Reasoning

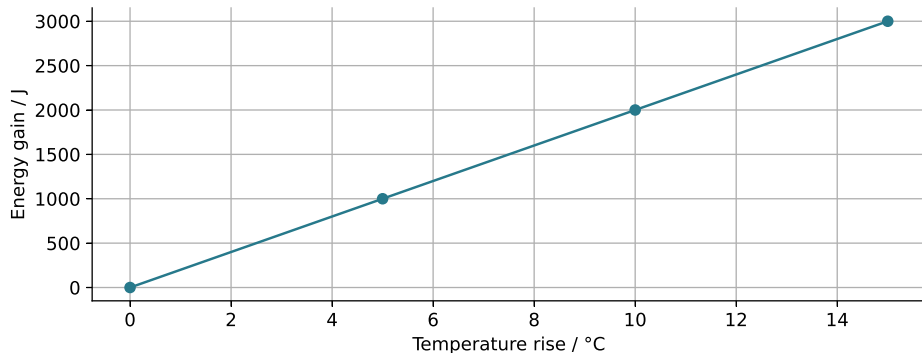
A temperature plateau always means zero energy transfer. This claim is false: A flat section of a heating curve can show a phase change, not absence of energy transfer. Do not substitute temperature for a temperature difference in $E = mc\Delta T$.

Thermal · 5.3

Reasoning

Thermal measurements and particle models: Temperature relates to particle motion in a model; internal energy includes kinetic and potential contributions. During a change of state, energy can change particle arrangements rather than temperature.

Thermal · diagram



- Original teaching diagram: Thermal measurements and particle models
- Use the labels and the stated model together.

Thermal · original transfer

Your turn

A fictional 0.50 kg block receives 2,000 J electrical energy and warms 8 K; 200 J heats its container and 200 J escapes. Find c and compare using all input.

Thermal · transfer reasoning

Method and interpretation

Block energy = 1,600 J; $c = 1,600 / (0.50 \times 8) = 400 \text{ J/(kg K)}$. The uncorrected 500 J/(kg K) is too high. State the system boundary and loss assumptions.

Check yourself

- Explain specific heat capacity using the stated model.
- Explain latent heat using the stated model.
- Change one value in the original transfer; explain which assumption still matters.