

Grade 10 Performance Task

Argument from evidence: fictional thermal-transfer cards

This is a paper-only reasoning task. The named designs and all readings are fictional card data. Do not build, operate, or evaluate a real device. Do not make product-safety, consumer-use, or lifetime claims. Total: 16 points.

Scenario. Two fictional thermal-transfer designs, C and D, are represented by sealed data cards. In each simulated trial, 100.0 g of water has the same starting temperature and contact time. Use $c_{\text{water}} = 4.184 \text{ J}/(\text{g } ^\circ\text{C})$. Positive ΔT means the water warmed.

Design	Trial 1 ΔT ($^\circ\text{C}$)	Trial 2 ΔT ($^\circ\text{C}$)	Trial 3 ΔT ($^\circ\text{C}$)
C	4.8	5.0	4.9
D	3.0	3.2	3.1

1. Calculate the mean ΔT for C and D. Then calculate q_{water} for C using C's mean ΔT . Show units and a sensible rounded result. [4 pts]

2. Write a bounded claim about which design transferred more energy to the water *in these simulated trials*. Cite at least two pieces of numerical evidence and state one limitation. [4 pts]

3. Explain the system boundary: identify what q_{water} describes, why setting $q_{\text{source}} = -q_{\text{water}}$ is an approximation here, and name one conclusion the cards do not support. [3 pts]

Item 4 - Paper-card experimental design

Student-facing boundary: respond only with a paper-card, bounded design. Do not collect personal data, build a device, or conduct any real testing.

4. Design a **paper-card follow-up** to test whether contact-time category changes energy transfer. Name the independent variable, dependent variable, at least two controls, a repeat plan, and an analysis/decision rule. **Explicitly state that your design is paper-card and bounded to the supplied data.** No real device testing or personal-data collection is authorized. [5 pts]
-
-