Tracking Energy in a Model Cooling Loop

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A class models a cooling loop that moves thermal energy from an insulated sample box to a warmer room. The loop uses electrical energy. After one test cycle the loop itself stores no extra energy. In the ideal case, the room receives both the energy removed from the box and the energy supplied electrically.

Cycle	Electrical energy supplied (J)	Thermal energy removed from box (J)	Thermal energy delivered to room (J)
P	100	140	240
Q	100	170	270

1 Which reading shows which cycle removes more thermal energy from the sample box?

(1) Electrical input in P and Q

(2) Box readings of 140 J in P and 170 J in Q

(3) The 100 J electrical reading in Q alone

(4) The 240 J room reading in P alone

2 Explain how the room can receive more energy than the electrical input without creating energy. Use cycle P. [1]

Answer and work

During a new cycle, the electrical meter records 120 J, the box loses 150 J, and the main outlet delivers 250 J to the room. The loop stores no extra energy. In this model any heat that misses the main outlet leaves through the casing.

3 Calculate how much energy would need to leave through the casing to account for all the energy entering the loop. [1]

Answer and work

4 Describe a separate measurement of the casing that could test the explanation. State what result would support it. [1]

Answer and work