Tracking Heat Through Two Reaction Paths

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

A reaction model starts with the same amount of substance A and ends with the same amount of substance C at the same temperature and pressure in both trials. The direct path goes from A to C. The two-step path goes from A to B and then from B to C. Positive energy changes mean the material absorbs energy. Negative changes mean it releases energy.

Step	**Energy change of the material (kJ)**
A to B	+40
B to C	−70
A to C in one step	−30

1 Which listed step requires a net energy input?

(1) A to B

(2) B to C

(3) A to C in one step

(4) Every listed step

2 Calculate the net energy change along the two-step path. Compare it with the direct measurement. [1]

Answer and work

3 A student says the two-step path releases 70 kJ overall because that is the amount measured in the second step. Explain what the comparison leaves out. [1]

Answer and work

A repeat starts with A and carries out only the first step. Its recovered material remains B. The model also tests the reverse change from B back to A.

4 Predict the net energy changes for the partial path and for its reverse. Explain why neither should be compared directly with the 30 kJ release from A to C. [1]

Answer and work