Competition Corner: State-Function Audit

g10_u02_w06 | track signs and states

Safe challenge: Use supplied equation and temperature cards only. No heating, mixing, or chemical handling is requested. $c_{\text{water}} = 4.184\ \text{J g}^{-1}\,^{\circ}\text{C}^{-1}$.

1. A 200.0 g water card warms by 2.50°C during 0.0400 mol reaction; a calorimeter constant of 25.0 J/°C applies. Find the modeled ΔH. Then state what changes if the cup is excluded from the surroundings calculation.

2. Given A→B, +35 kJ; B→C, −90 kJ; and C→2D, +20 kJ, find ΔH for 2D → A. Show reversal/scaling explicitly.

3. Two sources give ΔH values for an equation, one with water liquid and one with water gas. Explain why both can be internally valid and why states cannot be erased when applying Hess's law.

4. A student says a catalyst makes an exothermic reaction "more exothermic." Correct the claim with an energy diagram and a Hess's-law explanation.