Grade 10 Unit 2 Quiz: Thermochemistry

Energy accounting, calorimetry, Hess reasoning, and model limits

Name: _____ **Date:** _____

Time: 30 minutes. **Tools:** calculator permitted. Use $c_{\text{water}} = 4.184$ J/(g °C). All situations are fictional paper models; distinguish measured evidence from a broader claim.

1. A system has $\Delta H = -125$ kJ. Which statement is correct? [1 pts]

   A. The system absorbed 125 kJ.

   B. The system released 125 kJ.

   C. The reaction must be fast.

   D. Products have more enthalpy than reactants.

2. On an energy diagram, products lie lower than reactants by 60 kJ. State ΔH and whether reaction is exothermic or endothermic. [2 pts]

3. A 100.0 g water sample warms from 21.5°C to 26.5°C. Calculate q_{water}, then q_{rxn} for a well-insulated cup with negligible cup heat capacity. [3 pts]

4. The same temperature rise is recorded in an uncovered cup. Name one way this can bias calculated reaction heat, and explain why the exact bias cannot be known without more information. [2 pts]

5. Use: $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$, $\Delta H = -394$ kJ; $\text{CO} + \frac{1}{2}\text{O}_2 \rightarrow \text{CO}_2$, $\Delta H = -283$ kJ. Find ΔH for $\text{C} + \frac{1}{2}\text{O}_2 \rightarrow \text{CO}$. [3 pts]

6. Bond-energy estimates give $\Delta H_{\text{rxn}} \approx +45$ kJ/mol. What does the positive sign indicate, and why is it an estimate rather than an exact value for every setting? [2 pts]

7. A data card lists $\Delta S_{\text{sys}} > 0$ and $\Delta H > 0$. Which pattern fits $\Delta G = \Delta H - T\Delta S$? [1 pts]

   A. Favorable only at sufficiently high temperature

   B. Favorable only at sufficiently low temperature

   C. Favorable at every temperature

   D. Never favorable

8. A poster says, "Negative ΔG proves this process is safe, useful, and will happen quickly." Identify two different overclaims or missing conditions. [2 pts]