Name _____ Date _____ Class _____

12–3 Review and Reinforcement

Hess's Law

Answer each of the following questions in the space provided.

1. What does Hess's law say about the enthalpy change for a net reaction?

2. Explain why Hess's law is useful in the chemistry laboratory.

3. How can ΔH be calculated for an equation in which the coefficients have been multiplied by a factor of two?

4. What happens to the sign of ΔH if a reaction is run in the reverse direction from the way it is written?

5. Can a reaction proceed in more than one direction? Explain your answer.

6. What is meant by the terms heat of fusion and heat of vaporization?

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12–3 *Review and Reinforcement (continued)*

Solve the following problems in the space provided. Show all your work.

7. The combustion of propene proceeds in two steps:

$CH_2CHCH_3(g) + H_2(g) \rightarrow CH_3CH_2CH_3(g)$ $\quad \Delta H° = -124$ kJ

$CH_3CH_2CH_3(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$ $\quad \Delta H° = -2220$ kJ

Calculate the value of $\Delta H°$ for the combustion of 2.70 mol of propene into carbon dioxide and water.

8. From the following enthalpy changes,

$2PbS(s) + 3O_2(g) \rightarrow 2PbO(s) + 2SO_2(g)$ $\quad \Delta H° = -827.0$ kJ

$PbO(s) + C(s) \rightarrow Pb(s) + CO(g)$ $\quad \Delta H° = +106.8$ kJ

calculate the value of $\Delta H°$ when 1.55 mol of PbS reacts to form lead in the following reaction: $2PbS(s) + 3O_2(g) + 2C(s) \rightarrow 2Pb(s) + 2CO(g) + 2SO_2(g)$. Is the reaction endothermic or exothermic?

9. Determine the change in enthalpy for the following reaction:

$$C \text{ (graphite)} + 2H_2(g) \rightarrow CH_4(g)$$

Use these reaction equations:

$C \text{ (graphite)} + O_2(g) \rightarrow CO_2(g)$ $\quad \Delta H° = -394$ kJ

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$ $\quad \Delta H° = -286$ kJ

$CO_2(g) + 2H_2O(l) \rightarrow CH_4(g) + 2O_2(g)$ $\quad \Delta H° = +890.3$ kJ