Chapter 7 Review Questions and Text Homework Solutions

Review Questions

8. Hess's law: In going from a particular set of reactants to a particular set of products, the change in enthalpy is the same whether the reaction takes place in one step or in a series of steps (ΔH is path independent). When a reaction is reversed, the sign of ΔH is also reversed but the magnitude is the same. If the coefficients in a balanced reaction are multiplied by a number, the value of ΔH is multiplied by the same number while the sign is unaffected.

9. Standard enthalpy of formation: The change in enthalpy that accompanies the formation of one mole of a compound from its elements with all substances in their standard states. The standard state for a compound has the following conventions:

   a. gaseous substances are at a pressure of exactly 1 atm.

   b. for a pure substance in a condensed state (liquid or solid), the standard state is the pure liquid or solid.

   c. for a substance present in solution, the standard state is a concentration of exactly 1 *M*.

   The standard state of an element is the form in which the element exists under conditions of 1 atm and 25˚C. ΔH_f^o values for elements in their standard state are, by definition, equal to zero.

Step 1:	reactants $\rightarrow$ elements in standard states	$\Delta H_1 = -\sum n_r \Delta H_f^o$ (reactants)
Step 2:	elements in standard state $\rightarrow$ products	$\Delta H_2 = \sum n_p \Delta H_f^o$ (products)
	reactants $\rightarrow$ products	$\Delta H^o_{reaction} = \Delta H_1 + \Delta H_2$

So: $\Delta H^o_{reaction} = \sum n_p \Delta H_f^o(\text{products}) - \sum n_r \Delta H_f^o(\text{reactants})$

Text Homework

126.

$I(g) + Cl(g) \rightarrow ICl(g)$	$\Delta H = -(211.3 \text{ kJ})$
$1/2\ Cl_2(g) \rightarrow Cl(g)$	$\Delta H = 1/2(242.3 \text{ kJ})$
$1/2\ I_2(g) \rightarrow I(g)$	$\Delta H = 1/2(151.0 \text{ kJ})$
$1/2\ I_2(s) \rightarrow 1/2\ I_2(g)$	$\Delta H = 1/2(62.8 \text{ kJ})$
$1/2\ I_2(s) + 1/2\ Cl_2(g) \rightarrow ICl(g)$	$\Delta H = 16.8 \text{ kJ/mol} = \Delta H^o_{f,\,ICl}$