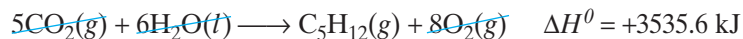


2 PLAN

Combine the given equations according to Hess's law. We need C_5H_{12} as a product, so we reverse the equation for combustion of C_5H_{12} and the sign for ΔH_c° . Multiply the equation for formation of CO_2 by 5 to give 5C as a reactant. Multiply the equation for formation of H_2O by 6 to give $6H_2$ as a reactant.

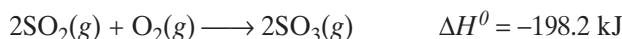
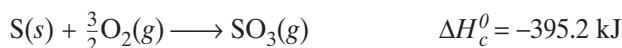
3 COMPUTE**4 EVALUATE**

The unnecessary reactants and products cancel to give the correct equation.

PRACTICE

Answers in Appendix E

1. Calculate the enthalpy of formation of butane, C_4H_{10} , using the balanced chemical equation and information in Appendix Table A-5 and Table A-14. Write out the solution according to Hess's law.
2. Calculate the enthalpy of combustion of 1 mol of nitrogen, N_2 , to form NO_2 using the balanced chemical equation and Appendix Table A-14.
3. Calculate the enthalpy of formation for sulfur dioxide, SO_2 , from its elements, sulfur and oxygen. Use the balanced chemical equation and the following information.

**extension**

Go to go.hrw.com for more problems that ask you to calculate enthalpies of formation and combustion.



Keyword: HC6NRGX

SECTION REVIEW

1. What is meant by enthalpy change?
2. What is meant by enthalpy of reaction?
3. Describe the relationship between a compound's stability and its enthalpy of formation.
4. What is the importance of Hess's law to thermodynamic calculations?
5. How much energy would be absorbed as heat by 75 g of iron when heated from 295 K to 301 K?

Critical Thinking

6. **INTEGRATING CONCEPTS** Isooctane (C_8H_{18}) is a major component of gasoline.
 - a. Using the following thermodynamic data, calculate the change in enthalpy for the combustion of 1.0 mol of isooctane.

$$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(g) \quad \Delta H^\circ = -241.8 \text{ kJ};$$

$$C(s) + O_2(g) \longrightarrow CO_2(g) \quad \Delta H^\circ = -393.5 \text{ kJ};$$

$$8C(s) + 9H_2(g) \longrightarrow C_8H_{18}(l) \quad \Delta H^\circ = -224.13 \text{ kJ}.$$
 - b. One gallon of isooctane has a mass of 2.6 kg. What is the change in enthalpy for the combustion of one gallon of this compound?