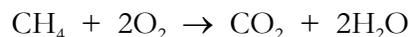
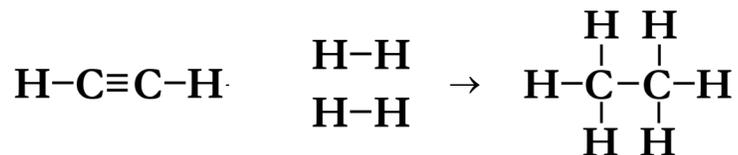


Extra Problems for Chapter 14

1. Using the bond energies table on page 420, determine the ΔH of the following reaction:

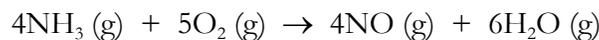


2. The ΔH of the following reaction is -280 kJ/mole . What is the energy of the $\text{C}\equiv\text{C}$ bond?



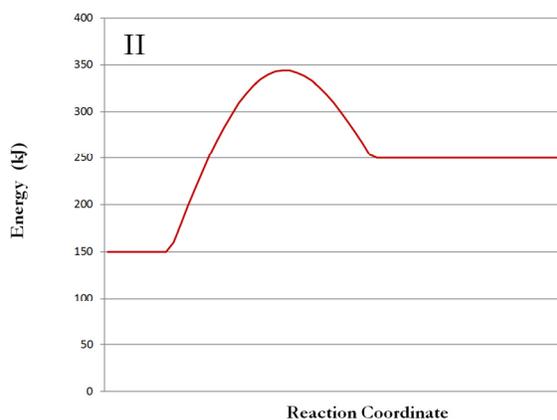
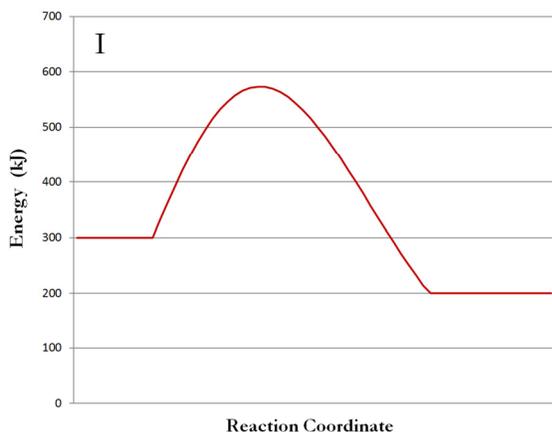
3. What is the ΔH for the complete combustion of $\text{CH}_4\text{O} (\text{l})$ at 25°C ? Use Hess's Law.

4. The ΔH for the following reaction is -902.0 kJ at 25°C . What is the ΔH_f° of $\text{NO} (\text{g})$?



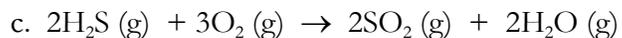
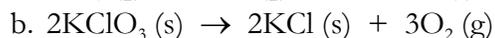
5. How much energy is released when 4.5 kg of $\text{CH}_4\text{O} (\text{l})$ undergoes complete combustion. (NOTE: You calculated the ΔH of that reaction in problem #3.)

6. Given the reaction coordinate diagrams below:



- Which represents an endothermic reaction?
- What is the ΔH of reaction I?
- What is the ΔH of reaction II?
- Which reaction has the highest activation energy?

7. Determine the sign of ΔS for the following reactions:



8. In problem 3, you calculated the ΔH for the complete combustion of $\text{CH}_4\text{O}(\text{l})$ at 25°C . Determine the ΔS for that same reaction.

9. Use the Hess's Law technique to calculate the ΔG of the complete combustion of $\text{C}_2\text{H}_6(\text{g})$ at 25°C . It is spontaneous?

10. The ΔH and ΔS of several reactions are given below. For each reaction, determine whether it is spontaneous at all temperatures, never spontaneous no matter what the temperature, or spontaneous for a range of temperatures. If it is spontaneous for a range of temperatures, give the range.

a. $\Delta H = -115.6 \text{ kJ}, \Delta S = -117.2 \text{ J/K}$

b. $\Delta H = 225.0 \text{ kJ}, \Delta S = -77.4 \text{ J/K}$

c. $\Delta H = 203.1 \text{ kJ}, \Delta S = 132.6 \text{ J/K}$

d. $\Delta H = -379.5 \text{ kJ}, \Delta S = 97.2 \text{ J/K}$