NAME: _____

General Chemistry
Mr. MacGillivray
Thermodynamics Calculations, Part II

Solve the following problems. Show formulas, units, and work for problems requiring calculations.

Suppose that 1.00 mol of C_3H_8 (g) reacts completely with O_2 (g) to produce CO_2 (g) and H_2O (g).

1. Write the balanced chemical equation for this reaction.

2. Calculate the enthalpy of this reaction. Don't forget the correct units.

3. Is this reaction exothermic or endothermic? How do you know?

4. Is this enthalpy change favorable or unfavorable?

5. Calculate the ΔS° for the reaction in #1. Use the correct units.

6. Is this entropy change favorable or unfavorable? How do you know?

7. Calculate the ΔG° for this reaction at 298 K. You may use either of the two formulas to calculate ΔG°. Make sure that you keep track of the units -- ΔS° usually has "**J**" as part of its units, but ΔH° usually has "**kJ**"!

8. Is the reaction spontaneous or not? How do you know?

9. Consider the following reaction:

$$X + 2W \rightarrow Y \qquad \Delta G^\circ = 40.9 \text{ kJ/mol}$$

Here is what this expression really means: In this reaction, if 1 mol of X is reacted with 2 mol of W, then 1 mol of Y is produced and this requires 40.9 kJ of energy. Therefore, in order to produce **2.96 mol of Y**, how many kJ of energy must be used? Show work. Include units.

10. In all of the calculations above (excluding #9), you assumed that 1.00 mol of C_3H_8 reacted. Now, re-calculate the ΔG° from #7 assuming that
    a. Only 0.393 mol of C_3H_8 reacts.

    b. Only 0.393 g of C_3H_8 reacts.