Name _____ GIBB'S FREE ENERGY PROBLEMS

1. The hydrogenation of ethene gas at 298. K shows a decrease in disorder (ΔS° = -0.1207 kJ/(mol•K)) during an exothermic reaction (ΔH° = -136.9 kJ/mol). Determine whether the reaction is spontaneous or nonspontaneous by calculating ΔG°. C_2H_4 (g) + H_2 (g) → C_2H_6 (g)

2. The vaporization of bromine requires 31.0 kJ/mol and has an increase in disorder (ΔS° = 0.093 kJ/(mol•K)). At what temperature will this process be spontaneous if the free energy value is 3.14 kJ/mol? Br_2 (l) → Br_2 (g)

3. Copper (I) sulfide reacts with sulfur to produce copper (II) sulfide at 25°C. The process is exothermic (ΔH° = -26.7 kJ/mol) with a decrease in disorder (ΔS° = -0.0197 kJ/(mol•K)). Determine the spontaneity of the reaction by calculating ΔG°. Cu_2S (s) + S (s) → 2 CuS (s)

4. For a certain process at 300. K, ΔG = -77.0 kJ/mol and ΔH = -56.9 kJ/mol. Find the entropy change for this process.

5. The entropy of a system at 337 K increases by 0.2217 kJ/mol•K. The free energy value is found to be –717.5 kJ/mol. Calculate the change in enthalpy of this system.

6. Determine if the following reaction is spontaneous or not 25°C by determining the free energy value.
2 NO_2(g) → N_2O_4(g) ΔH= -57.2 kJ/mol ΔS = -0.1759 J/ mol•K