Chapter 9 - Lecture Worksheet 3

1. For the following reaction $\Delta H^0 = -197.8$ kJ/mol and $\Delta S^0 = -187.9$ J/mol K. Assuming that ΔH^0 and ΔS^0 are independent of temperature, calculate the equilibrium constant for this reaction at 262 K.

$2SO_2(g) + O_2(g)$ <------> $2SO_3(g)$

A.) 1.7×10^{-10}
B.) 2.4×10^{-30}
C.) 5.9×10^{9}
D.) 4.2×10^{29}
E.) 7.2×10^{99}

2A. Carbonyl bromide, $COBr_2$, decomposes to CO and Br_2 at 73^0C. If you begin with 0.10 moles of $COBr_2$ in a 2.5 Liter flask and find that there are 0.015 moles of $COBr_2$ at equilibrium, what are the concentrations of CO and Br_2 at equilibrium ? **You must use the ICE method to solve this problem.**

$COBr_2$ (g) <------> CO(g) + Br_2(g)

1. 0.0030 M
2. 0.0060 M
3. 0.040 M
4. 0.085 M
5. 0.034 M
6. 0.068 M

B. What is the value of the equilibrium constant K_c at 73^0C ?

1. 0.18
2. 0.19
3. 5.2
4. 5.7

C. This reaction is

1. REACTANT FAVORED **2.** PRODUCT FAVORED **3.** Not strongly REACTANT OR PRODUCT FAVORED at equilibrium.

D. You would expect ΔG^0 to be

1. GREATER THAN ZERO **2.** LESS THAN ZERO **3.** EQUAL TO ZERO

E. This is because

F. Calculate ΔG^0 for this reaction.

G. Do you think ΔG^0 will change sign at high temperature vs low temperature ? **1. Yes 2. No**
Explain.

H. Sketch a Gibbs Free Energy diagram *v.s.* Extent of reaction diagram for this reaction. *(Label everything!)* Show the region where $Q < K$, $Q = K$ and $Q > K$.