Problems on Chemical Equilibria

Problems from Atkins Chapter 9 (with some rewording)

9.8.a) $N_2O_4(g)$ is 18.46% dissociated at 25°C and standard pressure. Calculate K and $\Delta_r G°$ at 25°C. Calculate K at 100°C, given that $\Delta_r H° = 57.2$ kJ/mole over the range.

Reaction: $N_2O_4(g) \rightleftarrows 2\ NO_2(g)$

Added question: Before looking at any data, how could you have predicted the signs of $\Delta_r H°$ and $\Delta_r S°$?

Problems from Atkins Chapter 9 (with some rewording)

9.15.b) The equilibrium constant for the reaction

$$N_2(g) + O_2(g) \rightleftarrows 2\ NO(g)$$

is 0.00169 at 2300 K. A mixture containing 5.0 g of nitrogen and 2.0 g of oxygen is sealed in a 1.0 L flask and heated to 2300 K. Calculate the mole fraction of NO at equilibrium.

Suggestion: set up the problem using a moles N_2 and b moles O_2. Substitute numbers at the end!

Problems from Atkins Chapter 9 (with some rewording)

9.19.a) The standard Gibbs free energy of formation of $NH_3(g)$ is –16.5 kJ/mole at 298 K and one atm. What is the spontaneous direction of reaction if the partial pressures of the gases are 3.0 atm, 1.0 atm, and 4.0 atm for N_2, H_2, and NH_3, respectively?