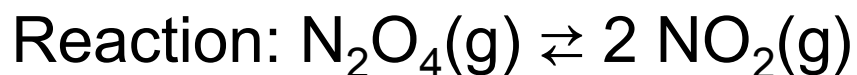


# Problems on Chemical Equilibria

## Problems from Atkins Chapter 9 (with some rewording)

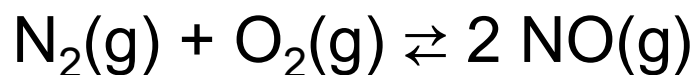
9.8.a)  $\text{N}_2\text{O}_4(\text{g})$  is 18.46% dissociated at  $25^\circ\text{C}$  and standard pressure. Calculate  $K$  and  $\Delta_r G^\circ$  at  $25^\circ\text{C}$ . Calculate  $K$  at  $100^\circ\text{C}$ , given that  $\Delta_r H^\circ = 57.2 \text{ kJ/mole}$  over the range.



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

## Problems from Atkins Chapter 9 (with some rewording)

9.15.b) The equilibrium constant for the reaction



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  $\text{N}_2$  and **b** moles  $\text{O}_2$ . Substitute numbers at the end!

## Problems from Atkins Chapter 9 (with some rewording)

9.19.a) The standard Gibbs free energy of formation of  $\text{NH}_3(\text{g})$  is  $-16.5 \text{ kJ/mole}$  at  $298 \text{ K}$  and one atm. What is the spontaneous direction of reaction if the partial pressures of the gases are  $3.0 \text{ atm}$ ,  $1.0 \text{ atm}$ , and  $4.0 \text{ atm}$  for  $\text{N}_2$ ,  $\text{H}_2$ , and  $\text{NH}_3$ , respectively?