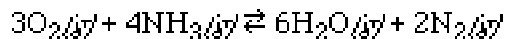


ALL work must be shown to receive full credit. **Due in lecture at 8:30 a.m. on Wednesday, March 13, 2002.**

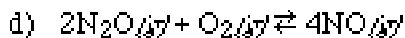
PS7.1. Given the reaction



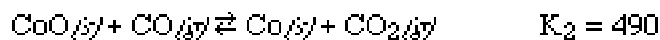
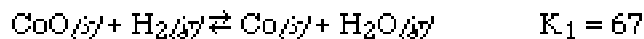
Initially (before any reaction occurs) a 1.00 liter reaction vessel at 400 °C contains 0.502 moles of O₂ and 0.791 moles of NH₃ and no water or nitrogen. Consider the following:

- a) If 0.0873 moles of O₂ react, how many moles of NH₃ must react and how many moles of H₂O and N₂ are formed? How many moles of O₂, NH₃, H₂O and N₂ remain after completion of the reaction?
- b) If 0.234 moles of NH₃ react, how many moles of O₂ must react and how many moles of H₂O and N₂ are formed? How many moles of O₂, NH₃, H₂O and N₂ remain after completion of the reaction?
- c) If '3x' moles of O₂ react, how many moles of NH₃ must react and how many moles of H₂O and N₂ are formed (in terms of 'x')? How many moles of O₂, NH₃, H₂O and N₂ remain after completion of the reaction?
- d) If 0.875 moles of H₂O are formed, how many moles of N₂ are formed and how many moles of O₂ and NH₃ must react? How many moles of O₂, NH₃, H₂O and N₂ remain after completion of the reaction?

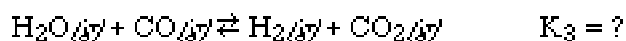
PS7.2. Write the equilibrium expression for each of the following chemical equations;



PS7.3. Equilibrium constants for the following reactions have been determined at 550 °C:



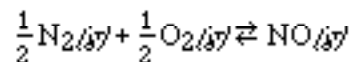
Calculate K (at the same temperature) for the commercially important water gas shift reaction



PS7.4. Calculate K_c for the reaction

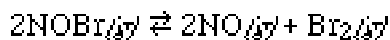


if K_c for the reaction



is 1.3×10^4 .

PS7.5. A 1.00 liter container initially holds 0.257 moles of NOBr at a given temperature. The reaction which occurs is:



At equilibrium analysis shows 0.240 moles of NO and 0.120 moles of Br₂.

- Which direction did the reaction proceed to establish (reach) equilibrium?
- How many moles of NOBr reacted in order to form 0.240 moles of NO and 0.120 moles of Br₂?
- How many moles of NOBr remain after equilibrium was established?
- What is the magnitude of K_c?

PS7.6. In a container, the partial pressure of NOCl is initially 0.340 atm at a given temperature. The chemical equation which describes the reaction is:



At equilibrium analysis shows the partial pressure of NO is 0.0916 atm.

- Which direction did the reaction proceed to establish (reach) equilibrium?
- What is the partial pressure of NOCl which reacted in order for the partial pressure of NO to be 0.0916 atm?
- What is the partial pressure of Cl₂ at equilibrium?
- What is the partial pressure of NOCl at equilibrium?
- What is the magnitude of K_p for the equation above?

PS7.7. A 1.00 liter container holds 1.06 moles of H₂ and 1.57 moles of CO at a temperature of 162 °C. At this temperature, the following reaction occurs,



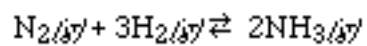
After equilibrium is established, analysis shows 0.200 moles of CH₃OH in the container. Calculate the [CO]_{eq}, [H₂]_{eq} and K_c.

PS7.8. The following reaction,



occurs at 298K. If 2.00 mol of HI are placed into a 1.00 liter container and permitted to react, at equilibrium it is found that 20.0 % of the HI has decomposed. Calculate K_c and K_p.

PS7.9 The equation which describes the preparation of ammonia is:



A 3.000 L reaction vessel initially contains 0.3000 moles N_2 and 0.4500 moles H_2 . When the reaction is allowed to attain equilibrium at a given temperature, analysis determines 0.09992 M N_2 . Calculate K_c for the reaction.