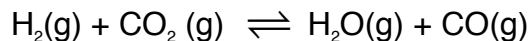


## Chapter 13 AP Carbon Monoxide Problem



When  $\text{H}_2(\text{g})$  is mixed with  $\text{CO}_2(\text{g})$  at 2 000. K, equilibrium is achieved according to the equation above. In one experiment, the following equilibrium concentrations were measured:

$$[\text{H}_2] = 0.20 \text{ mol/L}$$

$$[\text{CO}_2] = 0.30 \text{ mol/L}$$

$$[\text{H}_2\text{O}] = [\text{CO}] = 0.55 \text{ mol/L}$$

- a) What is the mole fraction of  $\text{CO}(\text{g})$  in the equilibrium mixture?
- b) Using the equilibrium concentrations given above, calculate the value of  $K_c$ , the equilibrium constant for the reaction.
- c) Determine  $K_p$  in terms of  $K_c$  for this system.
- d) When the system is cooled from 2000. K to a lower temperature, 30.0 percent of the  $\text{CO}(\text{g})$  is converted back to  $\text{CO}_2(\text{g})$ . Calculate the value of  $K_c$  at this lower temperature.
- e) In a different experiment, 0.50 mole of  $\text{H}_2(\text{g})$  is mixed with 0.50 mole of  $\text{CO}_2(\text{g})$  in a 3.0 liter reaction vessel at 2000 K. Calculate the equilibrium concentration, in moles per liter,  $\text{CO}(\text{g})$  at this temperature.

Answers: a) 0.34 b) 5.0 c) 5.0 d) 0.92 (This was with rounding every step. Without rounding in between it's more like 0.87) e) 0.12 M (or 0.11M )