AP Chemistry Name _____

Date _____ Per _____

Chapter 13 AP Carbon Monoxide Problem

$H_2(g) + CO_2(g) \rightleftharpoons H_2O(g) + CO(g)$

When $H_2(g)$ is mixed with $CO_2(g)$ at 2 000. K, equilibrium is achieved according to the equation above. In one experiment, the following equilibrium concentrations were measured:
$[H_2] = 0.20$ mol/L
$[CO_2] = 0.30$ mol/L
$[H_2O] = [CO] = 0.55$ mol/L

a) What is the mole fraction of CO(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 CO(g) is converted back to $CO_2(g)$. Calculate the value of K_c at this lower temperature.

e) In a different experiment, 0.50 mole of $H_2(g)$ is mixed with 0.50 mole of $CO_2(g)$ in a 3.0 liter reaction vessel at 2000 K. Calculate the equilibrium concentration, in moles per liter, CO(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)