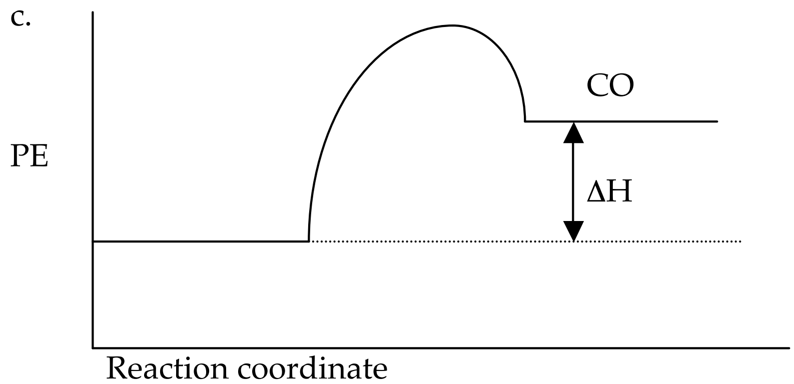
ASSIGNMENT SHEET #7 APQ ANSWERS

7

b. According to Le Chatelier, ΔH must be + because when we increase the temperature, we favored the forward reaction, generating more CO.

c.



d. No effect. $[C_{(s)}]$ is constant due to its solid state.

14

a. $K_c = \dfrac{[H_2]^2[S_2]}{[H_2S]^2}$

b. $[S_2]_{eq} = \dfrac{3.72 \times 10^{-2}\,mole}{1.25L} = 0.0296$ M

$[H_2]_{eq} = 2[S_2]_{eq} = 0.0595$ M

$[H_2S]_{eq} = 0.08\ M_{init} - 0.0595\ M = 0.0205$ M

c. $K_c = \dfrac{(0.0595M)^2(0.0296M)}{(0.0205M)^2} = 0.25$

d. $P = \dfrac{nRT}{V} = 1.18$ atm

e. $K_c' = \sqrt{\dfrac{1}{K_c}} = \sqrt{\dfrac{1}{0.25}} = 2$

34

a. moles CO will decrease (H_2 is on the right side of the equation, favoring reverse reaction)
b. moles CO will increase (ΔH = +, so increasing temp favors forward reaction)
c. moles CO will decrease (fewer gas particles on the left side of the equation, so in order to reduce the increase in pressure, favors reverse reaction)
d. moles CO will not change (no $\Delta[C_{(s)}]$; equilibrium simply reached faster)

44

c. At constant volume, the addition of the non-reactive inert gas does not change the partial pressures of the reacting components (P_{total} increases, mole fractions decrease proportionally).

d. If volume decreases, total pressure increases. Therefore, the system will favor the side of the equation that has fewer gas particles. In this case, that is the reactant (left) side. Therefore, the reverse reaction is favored, which will decrease the number of moles of Cl_2.

53

a. mole fraction of CO = 0.344

b. $K_c = \dfrac{[H_2O][CO]}{[H_2][CO_2]} = \dfrac{(0.55)^2}{(0.2)(0.3)} = 5.04$

c. $K_p = K_c(RT)^{\Delta n} = K_c$ since $\Delta n = 0$ (recall that Δn = change in gas particles during reaction)

d. $K_c = \dfrac{(0.385M)^2}{(0.365M)(0.465M)} = 0.873$

e. $K_c = 5.04 = \dfrac{(x)^2}{(\frac{0.5mole}{3L} - x)^2}$ x = 0.115 M

701

a. P_{total} = 0.8 atm

b. $P_{total} = P_{SO_2Cl_2} + P_{SO_2} + P_{Cl_2}$ $P_{SO_2Cl_2}$ = 0.17 atm $P_{SO_2} = P_{Cl_2}$ = 0.63 atm

c. $K_p = \dfrac{P_{SO_2} \times P_{Cl_2}}{P_{SO_2Cl_2}}$ = 2.33 atm

d. The value of the equilibrium constant, K_p, will increase. Increasing the temp favors the forward reaction in this case due to its endothermic nature. This will in turn increase the products' partial pressures (the numerator of the K_p expression) and decrease the reactant partial pressure (the denominator of the K_p expression).

702

a. $K_P = P_{NH_3} \text{ x } P_{H_2S} = 0.11$

b. P_{NH_3} = 0.466 atm P_{H_2S} = 0.233 atm

c. 0.007 moles NH_4HS