Equilibrium

Part 2

Calculating k_{eq}

- If you don't know all of the [equilibrium], you must make an ICE table
- Fill in what you know & solve for all unknowns

Calculating k_{eq}

- A mixture of 5.00 x 10^{-3} mol of H_2 and 1.000 x 10^{-2} mol of I_2 are placed into a 5.000 L container at 448°C and allowed to come to equilibrium. Analysis of the equilibrium showed that [HI] was 1.87 x 10^{-3} M. Calculate k_c at 448°C.

Calculating k_{eq}

$H_2 + I_2 \rightleftarrows 2HI$

I			
C			
E			

Calculating k_{eq}

- $2SO_3 \rightleftarrows 2SO_2 + O_2$
- $[SO_3]_{initial} = 6.09 \times 10^{-3}$ M
- $[SO_3]_{eq} = 2.44 \times 10^{-3}$ M
- Calculate Kc

Calculating k_{eq}

$2SO_3 \rightleftarrows 2SO_2 + O_2$

I			
C			
E			

Calculating k_{eq}

- 1.000 mol of H_2 and 2.000 mol I_2 are placed in a 1.000 L container. The k_c for this reaction is 50.5. Calculate the equilibrium concentrations for H_2, I_2, and HI

Calculating k_{eq}

$H_2 + I_2 \rightleftarrows 2HI$

I			
C			
E			

Calculating k_{eq}

- $PCl_5 \rightleftarrows PCl_3 + Cl_2$
- $K_p = 0.497$
- $(P_{PCl3})_{initial} = 1.66$ atm
- Calculate all equilibrium partial pressures

Calculating k_{eq}

$PCl_5 \rightleftarrows PCl_3 + Cl_2$

I			
C			
E			

LeChâtelier's Principle

- Le Châtelier's principle states that if a system at equilibrium is subjected to a stress, the equilibrium is shifted in the direction that tends to relieve the stress.
- Stresses include: _____, _____, _____ & _____
- Stresses DO NOT include: adding a _____ & increasing _____

Concentration

$CO + 3H_2 \leftrightarrow CH_4 + H_2O$

- Which way does the equilibrium shift if [CO] is increased
- Which way does the equilibrium shift if $[CH_4]$ is increased
- Which way does the equilibrium shift if $[H_2]$ is increased
- Which way does the equilibrium shift if $[H_2O]$ is increased

Concentration

$N_2 + 3H_2 \leftrightarrow 2NH_3$

- Add N_2
- Add H_2
- Add NH_3
- Remove N_2
- Remove H_2
- Remove NH_3

Temperature

$CO + 3H_2 \leftrightarrow CH_4 + H_2O \quad \Delta H = -206KJ$

- Increase the temperature
- Decrease the temperature

Volume & Pressure

- When doing volume & Pressure…you look at the number of moles
- **$CO + 3H_2 \leftrightarrow CH_4 + H_2O$**

Volume & Pressure

- **$CO + 3H_2 \leftrightarrow CH_4 + H_2O$**
- Increase the pressure
- Increase the volume
- Decrease the volume
- Decrease the pressure
- Added He to the system

Volume & Pressure

$H_2 + I_2 \leftrightarrow 2HI$

Increase Volume & pressure → no change