Key

Chemistry 12 Worksheet on K_{eq}

Calculating Keq and the Relation of Keq to Endothermic and Exothermic Reactions

Name: _____ **Date:** _____

1. The reaction:
   $A_{(g)} + B_{(g)} \longleftrightarrow C_{(g)}$ has a $K_{eq} = 4.6$ at 20°C. At 400°C, the $K_{eq} = 3.3$.
   Is this reaction exothermic or endothermic? Explain .

   Exothermic. Increasing temperature resulted in a lower Keq (less product). Thus, increasing temperature favoured the reactants and increasing temperature will drive reaction towards the endothermic side of the equation. Thus, the reaction is exothermic.

2. At equilibrium, in a 2.0 L container:
   [A] = 0.50 M; [B] = 0.33 M ; [C] = 0.25 M ; [D] = 0.20 M
   for the system:
   $3A_{(g)} + B_{(g)} \text{<--> } C_{(g)} + 2D_{(g)}$
   What is the value of the equilibrium constant ?

   $K_{eq} = \frac{[D]^2[C]}{[A]^3[B]}$ / $K_{eq} = \frac{(0.20)^2(0.25)}{(0.50)^3(0.33)}$

   $K_{eq} = 0.24$

3. The equation below shows the reaction between $NO_{2(g)}$ and $SO_{2(g)}$:

$$NO_{2(g)} + SO_{2(g)} \longleftrightarrow SO_{3(g)} + NO_{(g)}$$

all need to be changed to [ ]

A mixture in a 10.0 L flask was analyzed at equilibrium and found to contain the following :

0.20 mol of $NO_{2(g)}$ 0.10 mol of $SO_{2(g)}$ 0.50 mol of $SO_{3(g)}$ 0.30 mol of $NO_{(g)}$

What is the equilibrium constant for this reaction?

$K_{eq} = \frac{[SO_3][NO]}{[NO_2][SO_2]}$ / $K_{eq} = \frac{(0.50)(0.30)}{(0.10)(0.20)}$

$K_{eq} = 7.5$

4. The K_{eq} value for the Haber process,

$$N_{2(g)} + 3H_{2(g)} \longleftrightarrow 2NH_{3(g)}$$

at a particular temperature and pressure is 75. If the equilibrium $[N_2]$ is 0.023 M and $[H_2]$ is 0.078 M, what is the equilibrium $[NH_3]$?

$K_{eq} = \frac{[NH_3]^2}{[N_2][H_2]^3}$ / $75 = \frac{[NH_3]^2}{[0.023][0.078]^3}$

$\sqrt{8.186 \times 10^{-4}} = \sqrt{[NH_3]^2}$ / $[NH_3] = 0.029\ M$