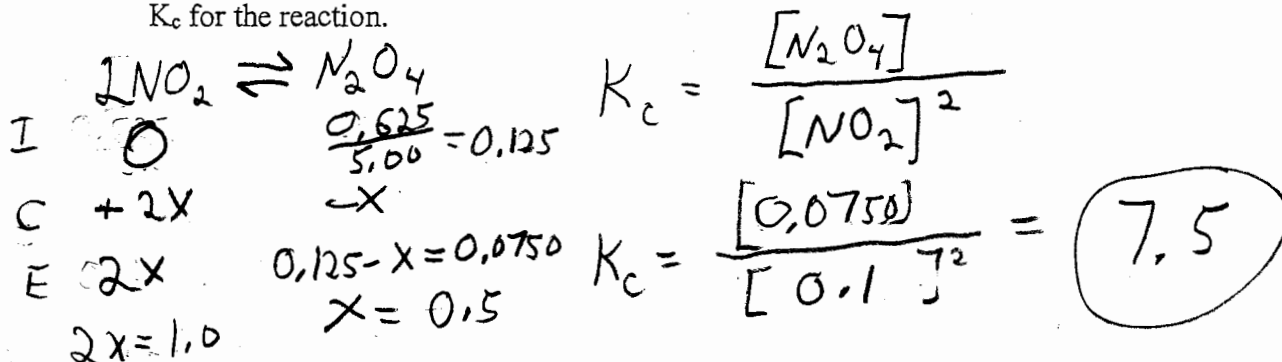


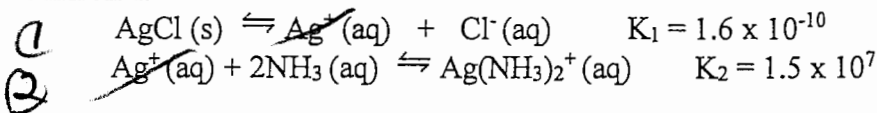
1. (4 Pts) Calculate K_c for the reaction $2\text{HI}(g) \rightleftharpoons \text{H}_2(g) + \text{I}_2(g)$ given that the concentrations of each species at equilibrium are as follows: $[\text{HI}] = 0.85 \text{ mol/L}$, $[\text{I}_2] = 0.60 \text{ mol/L}$, $[\text{H}_2] = 0.27 \text{ mol/L}$.

$$K_c = \frac{[\text{H}_2][\text{I}_2]}{[\text{HI}]^2} = \frac{[0.27][0.60]}{[0.85]^2} = 0.224$$

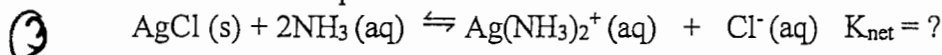
2. (4 Pts) The brown gas NO_2 and the colorless gas N_2O_4 exist in equilibrium, $2\text{NO}_2 \rightleftharpoons \text{N}_2\text{O}_4$. In an experiment, 0.625 mole of N_2O_4 was introduced into a 5.00 L vessel and was allowed to decompose until equilibrium was reached. The concentration of N_2O_4 at equilibrium was 0.0750 M. Calculate K_c for the reaction.



3. (3 Pts) The solubility of silver chloride can be increased by dissolving it in a solution containing ammonia.



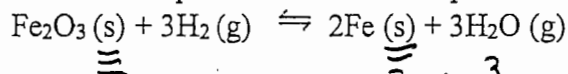
What is the value of the equilibrium constant for the overall reaction?



The top 2 equations add up to Equation 3

$$\text{SO: } K_{\text{net}} = K_1 \times K_2 = 2.4 \times 10^{-3}$$

4. (3 Pts) Write correct equilibrium constant expression for the following reaction?



$$K_c = \frac{[\text{H}_2\text{O}]^3}{[\text{H}_2]^3}$$

— more on back —

5. (4 Pts) At 700 K, the reaction $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$ has the equilibrium constant $K_c = 4.3 \times 10^5$, and the following concentrations are present: $[\text{SO}_2] = 0.10 \text{ M}$; $[\text{SO}_3] = 10. \text{ M}$; $[\text{O}_2] = 0.10 \text{ M}$. Which of the following is true based on the above?
- A) $Q_c > K_c$, the reaction proceeds from left to right to reach equilibrium
 - B) $Q_c > K_c$, the reaction proceeds from right to left to reach equilibrium
 - C) $Q_c < K_c$, the reaction proceeds from left to right to reach equilibrium**
 - D) $Q_c < K_c$, the reaction proceeds from right to left to reach equilibrium
 - E) $Q_c = K_c$, the reaction is currently at equilibrium

$$Q_c = \frac{[\text{SO}_3]^2}{[\text{SO}_2]^2 [\text{O}_2]} = \frac{(10.)^2}{[0.10]^2 [0.10]} = 1.0 \times 10^5 \quad Q_c < K_c$$

(needs more product)

6. (3 Pts) The equilibrium constant for the reaction $\text{Ni}(\text{s}) + 4\text{CO}(\text{g}) \rightleftharpoons \text{Ni}(\text{CO})_4(\text{g})$ is 5.0×10^4 at 25°C . What is the equilibrium constant for the reaction $\text{Ni}(\text{CO})_4(\text{g}) \rightleftharpoons \text{Ni}(\text{s}) + 4\text{CO}(\text{g})$?

Since: $K_{c1} = \frac{[\text{Ni}(\text{CO})_4]}{[\text{CO}]^4} = 5.0 \times 10^4$

and $K_{c2} = \frac{[\text{CO}]^4}{[\text{Ni}(\text{CO})_4]}$

$$K_{c2} = \frac{1}{5.0 \times 10^4} = 2 \times 10^{-5}$$

7. (4 Pts) The reaction $\text{A}(\text{g}) + 2\text{B}(\text{g}) \rightleftharpoons \text{C}(\text{g})$ was allowed to come to equilibrium. The initial amounts of reactants placed into a 5.00 L vessel were 1.0 mol A and 1.8 mol B. After the reaction reached equilibrium, 1.0 mol of B was found. Calculate K_c for this reaction.

	$\text{A}(\text{g})$	$+ 2\text{B}(\text{g})$	\rightleftharpoons	$\text{C}(\text{g})$
	moles	moles		moles
I	1.0	1.8		0
C	-x	-2x		x
E	1.0-x	1.8-2x		x

$$K_c = \frac{\left[\frac{0.4}{5.00}\right]}{\left[\frac{0.6}{5.00}\right] \left[\frac{1.0}{5.00}\right]^2}$$

@ E: $1.8 - 2x = 1.0$
 $2x = 0.8$
 $x = 0.4$

$$K_c = 16.7 \text{ or } 17$$

So E

$\text{A}(\text{g})$	$2\text{B}(\text{g})$	$\text{C}(\text{g})$
$\frac{0.6}{5.00}$	$\frac{1.0}{5.00}$	$\frac{0.4}{5.00}$