

Name _____ Date _____ Hr _____

Worksheet 8-2 - Equilibrium Constants

1. Write equilibrium constant expressions for the following:
 $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{SO}_3(\text{g})$

2. Write equilibrium constant expressions for the following:
 $2 \text{CO}(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{CO}_2(\text{g})$

3. Write equilibrium constant expressions for the following:
 $2 \text{H}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{H}_2\text{O}(\text{l})$

4. a. Write equilibrium constant expressions for the following:
 $\text{Fe}_3\text{O}_4(\text{s}) + 4 \text{H}_2(\text{g}) \leftrightarrow 3 \text{Fe}(\text{s}) + 4 \text{H}_2\text{O}(\text{g})$

b. If $K=17$
Claim: Does this reaction "lie to the left" or "lie to the right"?

Evidence: Provide evidence for your claim.

Reasoning: Explain why your claim is valid using scientific principles.

5. a. Write the equilibrium constant expression for the following: $\text{NH}_4\text{Cl}(\text{s}) \leftrightarrow \text{NH}_3(\text{g}) + \text{HCl}(\text{g})$

b. If $K=8.9 \times 10^{-4}$

Claim: Does this reaction "lie to the left" or "lie to the right"?

Evidence: Provide evidence for your claim.

Reasoning: Explain why your claim is valid using scientific principles.

6. Given the equilibrium expression to the right, determine and write the reaction that gave this expression. Assume all molecules are gases.
$$K_{\text{eq}} = \frac{[\text{C}]^c [\text{D}]^d}{[\text{A}]^a [\text{B}]^b}$$

7. Given the equilibrium expression to the right, determine and write the reaction that gave this expression. Assume all molecules are gases.
$$K = \frac{[\text{NO}]^2 [\text{O}_2]}{[\text{NO}_2]^2}$$

Review: Do 1-12 skip #3, 7, 8 & 9

- Explain what is meant by "dynamic" equilibrium.
- Compare and contrast the equilibrium constant expression and the equilibrium constant.
- Compare and contrast the equilibrium constant and the reaction quotient.
- What does it mean to say that an equilibrium "lies to the left"? What does it mean when an equilibrium "lies to the right"?
 - A large K_{eq}
 - A small K_{eq}
- Write equilibrium constant expressions for the following.
 - $2 \text{H}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{H}_2\text{O}(\text{g})$
 - $2 \text{NO}(\text{g}) + \text{Br}_2(\text{g}) \leftrightarrow 2 \text{NOBr}(\text{g})$
 - $\text{NaCl}(\text{s}) + \text{H}_2\text{SO}_4(\text{l}) \leftrightarrow \text{HCl}(\text{g}) + \text{NaHSO}_4(\text{s})$
 - $\text{P}_4(\text{s}) + 6 \text{NO}(\text{g}) \leftrightarrow \text{P}_2\text{O}_6(\text{s}) + 3 \text{N}_2(\text{g})$
- For the following reaction, $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{SO}_3(\text{g})$, the equilibrium concentrations are $[\text{SO}_2] = 0.175 \text{ M}$, $[\text{O}_2] = 0.35 \text{ M}$, and $[\text{SO}_3] = 0.70 \text{ M}$. Find K_{eq} .
- For the following reaction, $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{NO}(\text{g})$, $K_{eq} = 1.2 \times 10^{-4}$. If the concentration of N_2 is 0.166 M and the concentration of O_2 is 0.145 M , what is the concentration of NO ?
 - A large K_{eq}
 - A small K_{eq}
- Solve for Q and determine which way the reaction will proceed for each of the following.
 - $\text{CaCO}_3(\text{s}) \leftrightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$
 $[\text{CO}_2] = 0.0004 \text{ M}$, $K_{eq} = 5.10$
 - $\text{Fe}_2\text{O}_3(\text{s}) + 3 \text{H}_2(\text{g}) \leftrightarrow 2 \text{Fe}(\text{s}) + 3 \text{H}_2\text{O}(\text{g})$
 $[\text{H}_2] = 0.45 \text{ M}$, $[\text{H}_2\text{O}] = 0.37 \text{ M}$, $K_{eq} = 0.064$
 - $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{NO}(\text{g})$
 $[\text{N}_2] = 0.81 \text{ M}$, $[\text{O}_2] = 0.75 \text{ M}$,
 $[\text{NO}] = 0.030 \text{ M}$, $K_{eq} = 0.0025$
- For each of the following changes in the reaction $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{SO}_3(\text{g})$, will they make the reaction shift toward the reactants, the products, or no change?
 - O_2 is added
 - SO_3 is removed
 - SO_3 is added
 - Volume is decreased
- Will adding heat to an endothermic reaction make a reaction at equilibrium proceed toward the products or reactants?
 - Landfills becoming full
 - Rising costs of fuel sources
 - Groundwater contamination
- For each of the concerns below, summarize the problem, what's causing the problem, and what can be done to alleviate the problem.
 - Landfills becoming full
 - Rising costs of fuel sources
 - Groundwater contamination

Also write the equilibrium expression for a, b, and c for Question 9.