

Multiple Choice

[2 pts each] Identify the letter of the choice that best completes the statement or answers the question.

- C 1. For a reaction at equilibrium,...
- A. the forward reaction rate is lower than the reverse reaction rate.
 - B. the forward reaction rate is higher than the reverse reaction rate.
 - C. the forward reaction rate is equal to the reverse reaction rate.
 - D. no reactions take place.
- D 2. For a reaction at equilibrium, the concentrations of the products...
- A. are always equal to the concentrations of the reactants.
 - B. are always greater than the concentrations of the reactants.
 - C. are always less than the concentrations of the reactants.
 - D. do not change.
- C 3. A very high value of K_{eq} ($K_{eq} \gg 1$) indicates that...
- A. equilibrium is reached quickly.
 - B. reactants are favored.
 - C. products are favored.
 - D. equilibrium has been reached.

Problems

Use the formulas on the information sheet to perform the following calculations.

4. Determine the equilibrium constant expressions for the following reactions.

a. [2 pts] $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2 \text{SO}_3(\text{g})$.

$$K_{eq} = \frac{[\text{SO}_3]^2}{[\text{SO}_2]^2[\text{O}_2]}$$

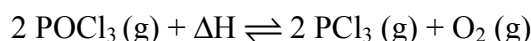
b. [2 pts] $2 \text{H}_2\text{S}(\text{g}) + 3 \text{O}_2(\text{g}) \rightleftharpoons 2 \text{H}_2\text{O}(\text{l}) + 2 \text{SO}_2(\text{g})$

$$K_{eq} = \frac{[\text{SO}_2]^2}{[\text{H}_2\text{S}]^2[\text{O}_2]^3}$$

5. [2 pts] Given $[\text{SO}_2] = 2.00 \text{ M}$, $[\text{O}_2] = 0.0313 \text{ M}$, and $[\text{SO}_3] = 10.0 \text{ M}$, calculate the value for K_{eq} for the reaction in part 14a. **Show your work and use the correct sig figs!**

$$K_{eq} = \frac{[\text{SO}_3]^2}{[\text{SO}_2]^2[\text{O}_2]} = \frac{[10.0]^2}{[2.00]^2[0.0313]} = 8.00 \times 10^2$$

6. [5 pts] Given the balanced reaction and a system in equilibrium,



in what direction (*left, right, no change*) will the system shift in response to the following stresses?

- | | | | |
|-------------------------------|--------------|----------------------------|------------------|
| a. Adding more PCl_3 | <u>Left</u> | b. Increasing the pressure | <u>Left</u> |
| c. Heating the mixture | <u>Right</u> | d. Adding a catalyst | <u>No Change</u> |

Extra Credit (1 point)

- C 7. The best thing about learning about equilibrium is
- A. it makes chemistry class really easy!
 - B. saying "Le Châtelier".
 - C. that nothing ever changes.
 - D. never having to worry about products!