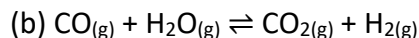
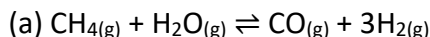


Writing Equilibrium Law Expressions and Calculating K - Worksheet

1. Write equilibrium law expressions for the following reactions:



2. Write balanced chemical equations for the following equilibrium law equations:

$$(a) K = \frac{[\text{H}_2(\text{g})][\text{Cl}_2(\text{g})]}{[\text{HCl}(\text{g})]^2}$$

$$(b) K = \frac{[\text{NO}(\text{g})][\text{SO}_3(\text{g})]}{[\text{SO}_2(\text{g})][\text{NO}_2(\text{g})]}$$

3. Phosphorus pentachloride gas, $\text{PCl}_5(\text{g})$, is produced by reacting phosphorus trichloride gas, $\text{PCl}_3(\text{g})$, with chlorine gas, $\text{Cl}_2(\text{g})$.

(a) Write a balanced chemical equation and an equilibrium law expression for this reaction.

(b) If the equilibrium concentrations for this reaction are $[\text{PCl}_3(\text{g})] = 0.380 \text{ mol/L}$, $[\text{Cl}_2(\text{g})] = 0.920 \text{ mol/L}$, and $[\text{PCl}_5(\text{g})] = 0.0250 \text{ mol/L}$, what is the value of K?

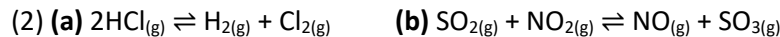
(c) Use your answer in (b) to calculate K' (reciprocal) for the reverse reaction.

4. Given the reaction at equilibrium $2\text{A} + \text{B} \rightleftharpoons \text{C} + 3\text{D}$ write the equilibrium expression and calculate the value of K if $[\text{A}] = 10.0 \text{ mol/L}$, $[\text{B}] = 15.0 \text{ mol/L}$, $[\text{C}] = 5.0 \text{ mol/L}$, $[\text{D}] = 25.0 \text{ mol/L}$.

5. At 25°C , K is 2.20×10^{-3} for the reaction $2\text{ICl}(\text{g}) \rightleftharpoons \text{I}_2(\text{g}) + \text{Cl}_2(\text{g})$. Calculate K for the reaction $\text{I}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2\text{ICl}(\text{g})$.

Answers:

$$(1) (a) K = \frac{[\text{CO}(\text{g})][\text{H}_2(\text{g})]^3}{[\text{CH}_4(\text{g})][\text{H}_2\text{O}(\text{g})]} \quad (b) K = \frac{[\text{CO}_2(\text{g})][\text{H}_2(\text{g})]}{[\text{CO}(\text{g})][\text{H}_2\text{O}(\text{g})]}$$



$$(3) (a) \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons \text{PCl}_5(\text{g}) \quad K = \frac{[\text{PCl}_5(\text{g})]}{[\text{PCl}_3(\text{g})][\text{Cl}_2(\text{g})]} ; (b) K = 0.0715; (c) K' = 1/0.0715 = 14.0$$

$$(4) K = \frac{[\text{C}][\text{D}]^3}{[\text{A}]^2[\text{B}]} ; K = 52$$

$$(5) K' = \frac{1}{2.20 \times 10^{-3}} = 454$$