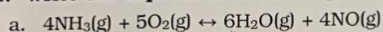
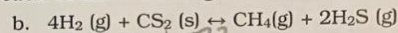


K_{eq} & LeChâtelier's Principle Practice

1. Write the expression for the equilibrium constant for each of the following reactions:

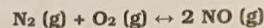


$$K_{eq} = \frac{[\text{H}_2\text{O}]^6 [\text{NO}]^4}{[\text{NH}_3]^4 [\text{O}_2]^5}$$



$$K_{eq} = \frac{[\text{CH}_4][\text{H}_2\text{S}]^2}{[\text{H}_2]^4}$$

2. At a high temperature the following system reaches equilibrium:



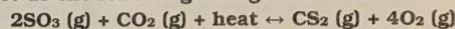
a.) An analysis of the equilibrium mixture in a 1 L flask gives the following results: nitrogen 0.05 mol; oxygen 0.50 mol; nitrogen monoxide 0.020 mol. Calculate K_{eq} for the reaction. Show all of your work!

$$K_{eq} = \frac{[\text{NO}]^2}{[\text{N}_2][\text{O}_2]} = \frac{[0.020]^2}{(0.050)(0.50)} = \frac{4 \times 10^{-4}}{0.025} = \boxed{0.016}$$

b.) Will the products or reactants be favored in the above reaction? Explain your answer.

reactants because K_{eq} is less than 1

3. Assuming that the reaction is at equilibrium, what effect do the following changes have on the equilibrium position (shifts left, right or no change)?



a. Addition of CO₂

shift right

d. Removal of O₂

shift right

b. Addition of heat

shift right

e. Addition of a catalyst

no change

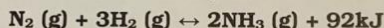
c. Increasing the volume

shift right

f. Addition of O₂

shift left

4. The industrial production of ammonia is described by this reversible reaction:



What would be the result of the following stresses to the system? Be specific: increase or decrease in reactants or product.

a. Removal of heat →

products [NH₃] would increase + reactants [N₂] + [H₂] would decrease

b. Removal of NH₃ →

products [NH₃] would increase + reactants [N₂] + [H₂] would decrease

c. Addition of H₂ →

products [NH₃] would increase + reactants [N₂] + [H₂] would decrease

d. Removal of N₂ ←

products [NH₃] would decrease + reactants [N₂] + [H₂] would increase

What stress(es) could you apply to the system to get the following results? List 2 for each result.

e. Increase in [NH₃] →

remove heat, add [N₂], add [H₂], decrease volume, remove [NH₃]

f. Increase in [H₂] ←

add [NH₃], add heat, remove [N₂], remove [H₂], increase volume

g. Decrease in [N₂] →

add [H₂], add [N₂], decrease volume, remove heat, remove [NH₃]