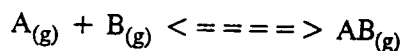


Solve each of the following problems. Show your work in the space provided. Write your final answer on the blank line.

Part A

1. Write an equilibrium expression for the following reaction:

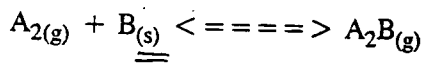


Then calculate the value of K_{eq} given that $[A] = 1.1 \times 10^{-3}M$, $[B] = 4.4M$, and $[AB] = 1.5 \times 10^{-8}M$. Finally, tell whether reactants or products are favored, and why.

$$K_{eq} = \frac{[AB]}{[A][B]} = \frac{(1.5 \times 10^{-8})}{(1.1 \times 10^{-3})(4.4)} = 3.1 \times 10^{-6}$$

Reactants are favored because K_{eq} is ^{smaller or} less than 1

2. Write an equilibrium expression for the following reaction:

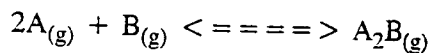


Then calculate the value of K_{eq} given that $[A_2] = 1.9 \times 10^{-3}M$, and $[A_2B] = 1.4 \times 10^{-5}M$. Finally, tell whether reactants or products are favored, and why.

$$K_{eq} = \frac{[A_2B]}{[A_2]} = \frac{1.4 \times 10^{-5}}{1.9 \times 10^{-3}} = 7.4 \times 10^{-3}$$

Reactants are favored because K_{eq} is ^{smaller or} less than 1

3. Write an equilibrium expression for the following reaction:



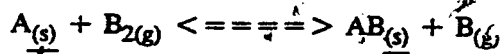
Then calculate the value of K_{eq} given that $[A] = 1.0 \times 10^{-6}M$, $[B] = 2.2 \times 10^{-4}M$, and $[A_2B] = 6.5 \times 10^{-1}M$. Finally, tell whether reactants or products are favored, and why.

$$K_{eq} = \frac{[A_2B]}{[A]^2[B]} = \frac{6.5 \times 10^{-1}}{(1.0 \times 10^{-6})^2(2.2 \times 10^{-4})} = 3.0 \times 10^{15}$$

Products are favored because K_{eq} is ^{greater or} greater than 1

4. Write an equilibrium expression for the following reaction:

Key.

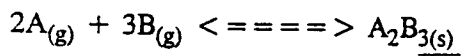


Then calculate the value of K_{eq} given that $[B_2] = 5.5 \times 10^{-4}M$, and $[B] = 3.9 \times 10^{-7}M$. Finally, tell whether reactants or products are favored, and why.

$$K_{eq} = \frac{[B]}{[B_2]} = \frac{3.9 \times 10^{-7}}{5.5 \times 10^{-4}} = 7.1 \times 10^{-4}$$

Reactants are favored because K_{eq} is less than 1.

5. Write an equilibrium expression for the following reaction:



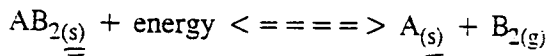
Then calculate the value of K_{eq} given that $[A] = 4.6 \times 10^{-3}M$, and $[B] = 1.5 \times 10^{-5}M$. Finally, tell whether reactants or products are favored, and why.

$$K_{eq} = \frac{1}{[A]^2[B]^3} = \frac{1}{(4.6 \times 10^{-3})^2(1.5 \times 10^{-5})^3} = 1.4 \times 10^{19}$$

Products are favored because K_{eq} is greater than 1.

Part B

6. Write an equilibrium expression for the following reaction:

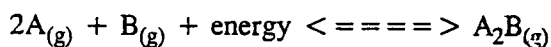


Then calculate the value of K_{eq} given that $[B_2] = 1.3 \times 10^{-9}M$. Finally, predict the effect of increased temperature on the value of K_{eq} and explain your answer.

$$K_{eq} = [B_2] = 1.3 \times 10^{-9}$$

Increasing temperature will shift the eq^m to the products, increasing $[B_2]$ and increasing K_{eq} because this reaction is endothermic

7. Write an equilibrium expression for the following reaction:



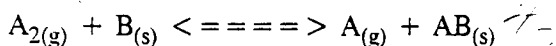
Then calculate the value of K_{eq} given that $[A] = 1.6 \times 10^{-2}M$, $[B] = 1.4 \times 10^{-4}M$, and $[A_2B] = 3.6 \times 10^{-1}M$. Finally, predict the effect of decreased temperature on the value of K_{eq} and explain your answer.

$$K_{eq} = \frac{[A_2B]}{[A]^2 [B]} = \frac{3.6 \times 10^{-1}M}{(1.6 \times 10^{-2}M)^2 (1.4 \times 10^{-4}M)} = 1.0 \times 10^7$$

This is an endothermic reaction, decreasing the temperature shifts the equilibrium towards the reactants and decreases K_{eq} .

Part C

8. Write an equilibrium expression for the following reaction:

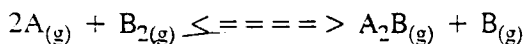


Then calculate the concentration of $A(g)$ given that $K_{eq} = 1.5 \times 10^{-3}$, and $[A_2] = 2.5 \times 10^{-4}M$. Finally, predict the effect of adding some $A_2(g)$ on the values for $[A]$, and explain your answer.

$$K_{eq} = \frac{[A]}{[A_2]} = 1.5 \times 10^{-3} = \frac{[A]}{2.5 \times 10^{-4}M} \quad [A] = 3.8 \times 10^{-7}M$$

Adding some $A_2(g)$ will increase the value for $[A]$ but will not change the value of K_{eq} .

9. Write an equilibrium expression for the following reaction:



Then calculate the concentration of A_2B , given that $K_{eq} = 7.1 \times 10^4$, $[A] = 1.9 \times 10^{-2}M$, $[B_2] = 4.1 \times 10^{-3}M$, and $[B] = 8.4 \times 10^{-3}M$. Finally, predict the effect of adding some $A_{(g)}$ on the values for $[B_2]$, $[A_2B]$, and $[B]$, and explain your answer.

$$K_{eq} = \frac{[A_2B][B]}{[A]^2 [B_2]} = 7.1 \times 10^4 = \frac{[A_2B] (8.4 \times 10^{-3}M)}{(1.9 \times 10^{-2}M)^2 (4.1 \times 10^{-3}M)}$$

$$[A_2B] = 1.2 \times 10^1 \sim 1.3 \times 10^1$$

Adding $A_{(g)}$ will shift the equilibrium to the products; $[B_2]$ will decrease, $[A_2B]$ and $[B]$ will increase. K_{eq} will not change.