

Chemistry 12

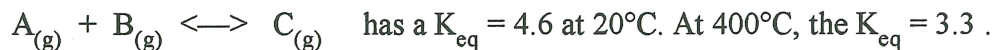
Worksheet on K_{eq}

Calculating K_{eq} and the Relation of K_{eq} to Endothermic and Exothermic Reactions

Name: _____

Date: _____

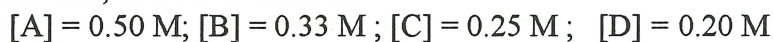
1. The reaction:



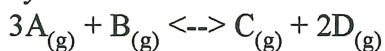
Is this reaction exothermic or endothermic? Explain .

Exothermic. Increasing temperature resulted in a lower K_{eq} (less product). Thus, increasing temperature favoured the reactants and increasing temperature will drive reaction towards the endothermic side of the equation. Thus, the reaction is exothermic.

2. At equilibrium, in a 2.0 L container:



for the system:



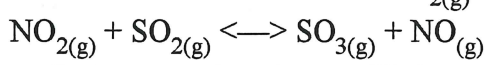
What is the value of the equilibrium constant ?

$$K_{eq} = \frac{[D]^2 [C]}{[A]^3 [B]}$$

$$K_{eq} = \frac{(0.20)^2 (0.25)}{(0.50)^3 (0.33)}$$

$$K_{eq} = 0.24$$

3. The equation below shows the reaction between $\text{NO}_{2(g)}$ and $\text{SO}_{2(g)}$:



all need to be changed to []

A mixture in a 10.0 L flask was analyzed at equilibrium and found to contain the following:

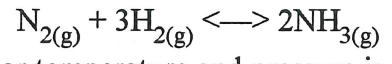
0.20 mol of $\text{NO}_{2(g)}$ 0.10 mol of $\text{SO}_{2(g)}$ 0.50 mol of $\text{SO}_{3(g)}$ 0.30 mol of $\text{NO}_{(g)}$

What is the equilibrium constant for this reaction?

$$K_{eq} = \frac{[\text{SO}_3][\text{NO}]}{[\text{NO}_2][\text{SO}_2]} \quad / \quad K_{eq} = \frac{(0.50)(0.30)}{(0.10)(0.20)}$$

$$K_{eq} = 7.5$$

4. The K_{eq} value for the Haber process,



at a particular temperature and pressure is 75. If the equilibrium $[\text{N}_2]$ is 0.023 M and $[\text{H}_2]$ is 0.078 M, what is the equilibrium $[\text{NH}_3]$?

$$K_{eq} = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3} \quad / \quad 75 = \frac{[\text{NH}_3]^2}{[0.023][0.078]^3}$$

$$\sqrt{8.186 \times 10^{-4}} = \sqrt{[\text{NH}_3]^2} \quad / \quad \underline{[\text{NH}_3] = 0.029 \text{ M}}$$