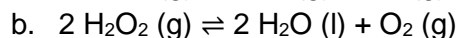
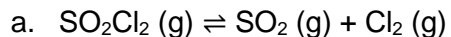
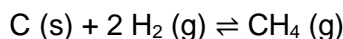


Equilibrium.

1. Write the equilibrium-constant expression (K_c) for each of the following reactions.



2. Consider the chemical equilibrium described below. Predict the way in which the equilibrium will shift in response to each of the following changes.



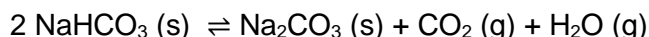
a. Decrease in the pressure of H_2

b. Increase in the pressure of CH_4

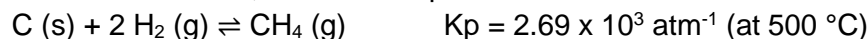
c. Adding $\text{C}(\text{s})$ to the flask

d. The volume is decreased

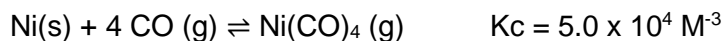
3. Sodium bicarbonate decomposes according to the equation below. Given that $K_p = 0.26 \text{ atm}^2$ at 125°C , calculate the partial pressures of $\text{CO}_2(\text{g})$ and $\text{H}_2\text{O}(\text{g})$ at equilibrium when $\text{NaHCO}_3(\text{s})$ is heated to 125°C in a closed vessel. ($\text{CO}_2 = 0.51 \text{ atm}$ $\text{H}_2\text{O} = 0.51 \text{ atm}$)



4. If 0.20 atm H_2 and $3.0 \text{ atm CH}_4(\text{g})$ are mixed in the presence of 4 grams of carbon at 500°C , determine if the reaction is at equilibrium. If it is not, determine if products or reactants will be formed. (*Products form*)



5. Given that $[\text{Ni}(\text{CO})_4] = 0.85 \text{ M}$ at equilibrium for the reaction below, calculate the concentration of $\text{CO}(\text{g})$ at equilibrium. ($[\text{CO}] = 0.0642 \text{ M}$)

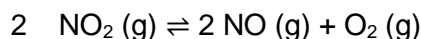


6. Phosgene, $\text{COCl}_2(\text{g})$, a toxic gas used in the synthesis of a variety of organic compounds, decomposes according to



A sample of phosgene gas at an initial concentration of 0.500 M is heated at 527°C in a reaction vessel. At equilibrium, the concentration of $\text{CO}(\text{g})$ was found to be 0.046 M . Calculate the equilibrium constant for the reaction at 527°C . ($K_c = 0.00466 \text{ M}$)

7. Nitrogen dioxide decomposes at high temperatures according to the equation:



Suppose initially we have pure $\text{NO}_2(\text{g})$ at 1000 K and 0.500 atm . If the total pressure is 0.732 atm when equilibrium is reached, what is the value of K_p (make sure to include the correct units)? (38.54 atm)

8. For the reaction below, calculate the equilibrium concentrations of $\text{ICl}(\text{g})$, $\text{I}_2(\text{g})$, and $\text{Cl}_2(\text{g})$ when 0.65 moles of $\text{ICl}(\text{g})$ is in a 1.5 liter reaction vessel. ($\text{I}_2 = 0.0875 \text{ M}$ $\text{Cl}_2 = 0.0875 \text{ M}$ $\text{ICl} = 0.258 \text{ M}$)

