

Name \_\_\_\_\_

## Equilibrium

Use the following equation to answer questions 1-5:  $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

- 1) Write the equilibrium expression for the reaction if all the compounds were gases.

$$k_{\text{eq}} = \frac{[\text{CO}_2][\text{H}_2\text{O}]^2}{[\text{O}_2]^2[\text{CH}_4]}$$

- 2) Write the equilibrium expression for the reaction if the water was condensed into a liquid.

$$k_{\text{eq}} = \frac{[\text{CO}_2]}{[\text{O}_2]^2[\text{CH}_4]}$$

- 3) Write the equilibrium expression for the reaction if it was done at  $-44^\circ\text{C}$  when both water and  $\text{CO}_2$  are solids.

$$k_{\text{eq}} = \frac{1}{[\text{O}_2]^2[\text{CH}_4]}$$

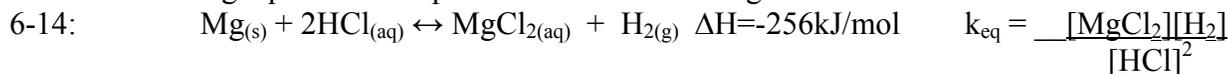
- 4) Write the equilibrium expression for the reaction if it was done at  $-158^\circ\text{C}$  when the methane would be a liquid and the water and carbon dioxide would be solids.

$$k_{\text{eq}} = \frac{1}{[\text{O}_2]^2}$$

- 5) Write the equilibrium expression for the reaction if the carbon dioxide was being dissolved into the liquid water that had been condensed.

$$k_{\text{eq}} = \frac{[\text{CO}_2]}{[\text{O}_2]^2[\text{CH}_4]}$$

Use the following equilibrium expression for the following reaction in a sealed container to answer questions



- 6) If the  $k_{\text{eq}} = 3.6 \times 10^3$  would we expect to find more reactants or products in the container?  
products

- 7) If the  $k_{\text{eq}} = 1$  would we expect to find more reactants or products in the container?  
both equal

- 8) If the  $k_{\text{eq}} = 4.2 \times 10^{-8}$  would we expect to find more reactants or products in the container?  
reactants

- 9) If the pressure in the container was raised, which way would the equilibrium shift?  
Left = more pressure favors side with less gas molecules

- 10) If the temperature of the container was reduced, then which way would the equilibrium shift?  
Right = less energy favors exothermic reactions

- 11) If the amount of HCl was increased, then which way would the equilibrium shift?  
Right = more collisions between reactants makes more products

- 12) If the amount of magnesium was increased, then which way would the equilibrium shift?  
Neither = solids have no effect on equilibrium

- 13) If the amount of hydrogen was decreased then what would happen to the amount of magnesium chloride in the container?

Increase = less hydrogen makes reverse reaction less likely to occur

- 14) If the temperature was increased, then would we find more reactants or less reactants in the container later?

More = increase in temperature makes endothermic process happen