Name _____ Date _____ Class _____

18 REACTION RATES AND EQUILIBRIUM

Practice Problems

In your notebook, solve the following problems.

SECTION 18.1 RATES OF REACTION

1. List three ways that reaction rates can generally be increased.
2. Ethyl acetate ($C_4H_8O_2$) reacts with a solution of sodium hydroxide (NaOH) in water to form sodium acetate ($C_2H_3O_2Na$) and ethyl alcohol (C_2H_6O). Suppose at 25°C two moles of ethyl acetate react completely in four hours. How would you express the rate of reaction?
3. How would the following actions likely change the rate of the reaction in problem 2?
   a. the temperature is lowered to 4°C.
   b. the concentration of sodium hydroxide in water is increased.
4. Ethyl acetate and water are not miscible; thus, the reaction in problem 2 only occurs at the interface of the two liquids. What would be the effect on the reaction rate of adding a solvent to make the reaction homogeneous?

SECTION 18.2 REVERSIBLE REACTIONS AND EQUILIBRIUM

1. Write the expression for the equilibrium constant for this reaction:
   $$2N_2O_5(g) \rightleftharpoons 4NO_2(g) + O_2(g)$$
2. Calculate the equilibrium constant for the reaction in problem 1 if the equilibrium concentrations are $[N_2O_5] = 0.50$ mol/L, $[NO_2] = 0.80$ mol/L, $[O_2] = 0.20$ mol/L.
3. How would the equilibrium position for the equation in problem 1 be affected by
   a. an addition of O_2 to the reaction vessel?
   b. a decrease in the pressure?
4. The equilibrium constant for the reaction of nitrogen dioxide to form dinitrogen tetroxide is 5.6.
   $$2NO_2(g) \rightleftharpoons N_2O_4(g)$$
   In a one-liter container, the amount of N_2O_4, at equilibrium, is 0.66 mol. What is the equilibrium concentration of NO_2?
5. Write the equilibrium constant expression for each of the following reactions.
   a. $4NO(g) + 2O_2(g) \rightleftharpoons 2N_2O_4(g)$
   b. $2NO(g) + Br_2(g) \rightleftharpoons 2NOBr(g)$
   c. $CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g)$
   d. $SO_2(g) + NO_2(g) \rightleftharpoons SO_3(g) + NO(g)$
6. What effect would an increase in pressure have on the equilibrium position of each reaction in problem 5?