NAME _____ PREF ____ SECTION SC_____ DATE _____

EXPERIMENT 29: CHEMICAL EQUILIBRIUM

Equipment: five 6 in. test tubes, test tube rack, stirrer
Materials: 2-3 mL 3M $FeCl_3$, 4-6 mL 3M NH_4SCN, 2-3 mL Fe^{+3}, few grams $Na_2HPO_{4(s)}$

In this experiment you will see how Le Chatelier's Principle functions as changes in concentration of reactants and products affect a chemical equilibrium.

A. Observe and note the color of $FeCl_{(aq)}$. _____

Observe and note the color of $NH_4SCN_{(aq)}$. _____

Into a 6 inch test tube place exactly one drop of 3M $FeCl_3$ and exactly one drop of 3M NH_4SCN. Fill the tube almost to the top with water, stir and divide the solution equally into five separate test tubes.

What is the color of the this solution? _____

B. The balanced *net* equation for the reaction is: $Fe^{+3}_{(aq)} + SCN^{-}_{(aq)} \rightleftarrows FeSCN^{+2}_{(aq)}$

Write the color of each ion below its formula or symbol. _____ _____ _____

1. What is a spectator ion? _____

   Which ions are spectators in this reaction? _____ _____

2. Both reactant solutions have the same concentration (3M) and we used equal volumes. Should there be any unused Fe^{3+} or SCN- ions in the solution after the reaction? _____

   Explain, using the balanced equation for the reaction. _____

   _____

C. To see if your predictions were correct, add 2 drops of the Fe^{3+} solution to the second tube and 2 drops of SCN^- solution to the third test tube.

3. What did you see in each case? _____

   _____

   _____

4. Look at the colors you filled-in in Part B. Which ion must have increased in concentration in order to explain the changes in the second test tube? _____ The third test tube. _____

5. From which two ions does this reaction make $FeSCN^{+2}$? _____ _____

6. In test tube #2 we added more Fe^{+3} and got more $FeSCN^{+2}$. What other ion must have been present? _____ How do you know? _____

7. In test tube #3 we added more SCN^- and got more $FeSCN^{+2}$. What other ion must have been present? _____ How do you know? _____

8. Explain these results in terms of equilibrium. _____

_____

_____

D. If the rate of a forward or reverse reaction depends on, among other factors, the concentration of reactant(s), we should be able to slow down the forward reaction by lowering the concentration of one or both of the reactants. The substance Na_2HPO_4 removes Fe^{+3} from solutions. Use the end of a splint as a spatula to add A FEW CRYSTALS of this substance to test tube #4.

9. What change do you observe? _____

10. Explain what you saw in terms of the rates of the forward and reverse reactions. _____

_____

_____

_____

E. Look at the color of the solution in each of the four test tubes. How can you tell that the reaction in each is at equilibrium? _____

CONCLUSIONS

A reaction which does not go to completion is said to be _____. Such a reaction is said to reach equilibrium when its forward and reverse reaction rates are _____. A reaction at equilibrium shows no _____ in any observable property. At equilibrium, the concentrations of all products and reactants are _____.

State Le Chatelier's Principle. _____

_____

_____

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