Chemistry 2000 Spring 2001 Section B Assignment 3

Due: Thursday, March 22, 10:50 a.m.

Note: You will have to look up some data from your textbook to answer most of these questions.

1. Suppose that you want to make a buffer with a pH of 3. Select an acid/conjugate base pair that would be suitable in this application and defend your choice. [3 marks]

2. An aqueous solution of sodium dihydrogen phosphate is mixed with an aqueous solution of sodium hydrogen carbonate. Does a reaction occur? If so, predict the reaction. If not, show what possibilities you tried and explain how you decided that a reaction would not occur. [10 marks]

   Note: What is being asked here is whether you expect a reaction to occur to a reasonable (measurable) extent. It is not necessary for a reaction to be strongly product-favored to predict a reaction. However, it is true that if a reaction is strongly product *dis*favored (has a really tiny equilibrium constant) we would not predict a reaction.

3. What is the pH of a 0.0053 mol/L solution of sodium hydrogen sulfate in water at 25°C? [10 marks]

4. What is the pH of a 0.0053 mol/L solution of sulfuric acid in water at 25°C? [10 marks]

5. The protonated aniline cation ($C_6H_5NH_3^+$) is a monoprotic acid (analogous to ammonium) with a pK_a of 4.6. This acid is normally made by reacting aniline ($C_6H_5NH_2$) with a strong acid. You are given 1 L of a 0.2 mol/L a aniline solution. You want to make a pH 5 buffer by adding 5 mol/L HCl solution. First though, you need to make up the HCl solution so you want to know roughly how much you will need. Calculate the approximate volume of HCl solution needed. [10 marks]