AP CHEMISTRY CHAPTER 15 SAMPLE PROBLEMS

Sample problem 1

In section 14.5 we found that the equilibrium concentration of H+ in a 1.0 M HF is 2.7 x 10-2 M and the percent dissociation of HF is 2.7%. Calculate the [H+] and the percent dissociation of HF in a solution containing 1.0 M HF (Ka= 7.2 x 10-4) and 1.0 M NaF

Sample problem 2

A buffered solution contains 0.50 M acetic acid (Ka = 1.8 x 10-5) and 0.50 M sodium acetate. Calculate the pH of this solution

Sample problem 3

Calculate the change in pH that occurs when 0.010 mol solid NaOH is added to 1.0 L of the buffered solution described in the previous problem. Compare this pH change with that which occurs when 0.010 mol solid NaOH is added to water.

Sample problem 4

Calculate the pH of a solution containing 0.75 M lactic acid (Ka = 1.4 x 10-4) and 0.25 M sodium lactate. Lactic acid (HC3H5O3) is a common constituent of biologic systems. For example, it is found in milk and is present in human muscle tissue during exertion.

Sample problem 5

A buffered solution contains 0.25 M NH3 (Kb = 1.8 x 10-5) and 0.40 M NH4Cl. Calculate the pH of this solution.

Sample problem 6

Calculate the pH of the solution that results when 0.10 mol of gaseous HCl is added to 1.0 L of the buffered solution from the previous problem

Sample problem 7

Calculate the change in pH that occurs when 0.010 mol gaseous HCl is added to 1.0 L of each of the following solutions.

Solution A: 5.00 M Acetic acid and 5.00 M sodium acetate

Solution B: 0.050 M acetic acid and 0.050 M sodium acetate

Ka for acetic acid = 1.8 x 10-5

Sample problem 8

A chemist needs a solution buffered at pH 4.30 and can choose from the following acids and their sodium salts.

a. chloroacetic acid (Ka = 1.35 x 10-3)

b. propanoic acid (Ka = 1.3 x 10-5)

c. benzoic acid (Ka = 6.4 x 10-5)

d. hypochlorous acid (Ka = 3.5 x 10-8)

Calculate the ratio [HA]/[A-] required for each system to yield a pH of 4.30. Which system will work best.

Sample problem 9

Hydrogen cyanide (HCN), a powerful respiratory gas, is highly toxic. It is a very weak acid (Ka = 6.2 x 10-10) when dissolved in water. If a 50.0 mL sample of 0.100 M HCN is titrated with 0.100 M NaOH, calculate the pH of the solution

after 8.00 mL of 0.100 M NaOH has been added

at the half-way point of the titration

at the equivalence point of the titration

Sample problem10

A chemist has synthesized a monoprotic weak acid and wants to determine its Ka value. To do so, the chemist dissolves 2.00 mmol of the solid acid in 100.0 mL water and titrates the resulting solution with 0.0500 M NaOH. After 20.0 mL NaOH has been added, the pH is 6.00. What is the Ka value for the acid?

Sample problem 11

Bromthymol blue, an indicator with a Ka value of 1.0 x 10-7, is yellow in its HIn form and blue in its In- form. Suppose we put a few drops of this indicator in a strongly acidic solution. If the solution is then titrated with NaOH, at what pH will the indicator color change first be visible?