CHM 112 Chapter 14 Extra Credit Part 2 **Name: _____Key_____**

Look up the values of K_a, or K_b in your book.

1. Calculate the concentration of all species as well as the pH for a 0.150 M solution of H_2CO_3(aq). pH = 3.60

2. Calculate the pH of a 0.0100 M solution of sulfurous acid. pH = 2.15 (you will need to do the quadratic)

3. Using an ICE table, calculate the pH of a solution that is 0.175 M in $NaNO_2$(aq) and 0.145 M in HNO_2(aq). pH = 3.42

4. Use the Henderson equation to calculate the pH of the 0.175 M in $NaNO_2$(aq) and 0.145 M in HNO_2(aq). Compare your answer to that obtained with a traditional ICE table. pH = 3.42

5. (A) Which of the following combinations will give a buffered solution that has a pH of about 5? Explain clearly the reason for your choice.

   a) NH_3 mixed with NH_4Cl (K_b for NH_3= 1.8 x10^{-5}) or b) C_5H_5N mixed with C_5H_5NHCl (K_b for C_5H_5N = 1.7x10^{-9})

   pH = pKa

   (B) What ratio of the concentrations of the conjugate acid/base pair from Part A will be needed to form a buffer solution with a pH of 6.2? Acid/Base = .11 or Base/Acid = 9.3

6. Calculate the pH of a solution made by mixing 50.0 mL of 0.10 M benzoic acid and 100. mL of 0.15 M potassium benzoate. pH = 4.67

7. Explain how our blood buffer system works. Use the reactions of $H_2PO_4^-$ /HPO_4^-.

8. Calculate the pH of a 1.00 L solution that is 0.250 M in trimethylamine and 0.350 M in trimethylammonium chloride. pH = 9.66

9. Calculate the pH after 0.100 moles of NaOH are added to the solution in 8. pH = 9.96

10. A solution contains 0.400 moles acetic acid and 0.600 moles potassium acetate in 1.50 L of solution.

    a) Calculate the pH of this solution. pH = 4.92

    b) What will be the pH of the solution after 0.100 mol of NaOH(s) is added to the solution in (a) pH = 5.11

    c) What will be the pH of the solution after 0.100 mol of HCl(g) is added to the solution in (a) pH = 4.74

11. 40.0 ml of 0.100 M HCl is titrated with 0.100 M KOH. Calculate the pH of the solution at each of the following steps in the titration.

    a) Initially before any KOH has been added. pH = 1

    b) 20.0 ml of KOH has been added pH = 1.48

    c) 39.0 ml of KOH has been added pH = 2.90

    d) 40.0 ml of KOH has been added pH = 7

    e) Sketch the titration curve

12. Consider the titration of 40.0 mL of 0.500 M NH_3 with 1.00 M HCl

a) What is the initial pH of the NH_3(aq)? pH = 11.73

b) What is the pH halfway to the equivalence point? pH = pKa = 9.25

c) What is the volume of HCl needed to reach the equivalence point? 20.0 mL

d) What is the pH at the equivalence point? pH = 4.86

e) Sketch the titration curve.
Label the point(s) where there is a A) a weak base B) weak acid C) Buffer D) Strong acid in excess,

13. A solution is 0.155 M in Na_2HPO_4 and 0.200 M in NaH_2PO_4. What is the pH of this solution? pH = 7.10