NAME:

Chemistry 232
Analytical Chemistry
In Class portion

1. A (5 points) Which of the following acids will be the best to make a pH 6.0 buffer with:
4-Methylanaline (pK_a 5.08), Succinic Acid (pK_a 5.64) , or Phosphorous acid (pK_a 6.79)

B (10 points) If I want the total (Formal) concentration of the buffer to be .05 M and the total volume to be 1.0L, how many moles of the acid, and how many moles of the conjugate base form of the above acid do I need to make this buffer.

2. (20 points) Valine is an amino acid with 2 pK_a's 2.29 and 9.72. What is the pH of a .01M solution of

A. Valine·HCl

B. Valine (Free base)

C. Valine·Na

3. Back on the last test you had a problem with where you were trying to calculate the concentrations of a mixture of $CaCl_2$ and 0.5M phosphoric acid at pH 8. This was a complicated problem because Phosphoric acid is a multiprotic acid (H_3A) with K_a's of 7.11×10^{-3}, 6.32×10^{-8} and 7.1×10^{-13}. Today you are in a much better position to attack this problem.

A. (5 points) What is the predominate form of phosphoric acid at this pH?

B. (15 points) Using any of the α equations below, calculate the exact concentration of this species in the solution:

$$\alpha_{H_2A} = \frac{H_2A}{F} = \frac{[H^+]^2}{[H^+]^2 + [H^+]K_1 + K_1K_2}$$

$$\alpha_{HA^-} = \frac{HA^-}{F} = \frac{[H^+]K_1}{[H^+]^2 + [H^+]K_1 + K_1K_2}$$

$$\alpha_{A^{2-}} = \frac{A^{2-}}{F} = \frac{K_1K_2}{[H^+]^2 + [H^+]K_1 + K_1K_2}$$

4. (5 points) I am going to do titration of a weak base with a strong acid, and I expect my equivalence point to be about pH=4. Of the following indicators, what is the best for this titration? Why? Thymol Blue pK_a =1.5, Erythrosine pK_a 2.9, Congo Red pK_a 4.0

Take Home Portion (do 2 of 3, if you do all three I will give you the 2 best scores)

1. (20 points) Calculate a titration curve for 20 mls of 0.012 M ammonia (a weak base) being titrated with 0.014M HCl. Include the following points in your calculations: Initial, after 10 ml of titrant, after 20 ml of titrant, and at the equivalence point.

2. (20 points) Calculate the titration curve for a 35 mL 0.10M solution of Iron(III) chloride being titrated with .095M EDTA at pH 7. Include the following points in your titration curve:
0, 20, 30, and 40 mL of EDTA.

3. (20 points) Calculate the titration curve for a 10 mL, 0.10 solution of the fully protonated form of Histidine being titrated with 0.1M NaOH. Include the following points: 0, 5, 10, 15, 20, 25, 30, and 35 mL titrant.