Mystery Acid Lab

Purpose: To determine the the ***concentration***, K_a, and ***identity*** of an unknown monoprotic acid using a titration.

Materials: unknown acid, 0.10 M sodium hydroxide, buret, funnel, 50 mL graduated cylinder, 100 mL beaker, phenolphthalein indicator, distilled water, pH probe,
Appendix 5 from your textbook

Procedure: Write a brief step by step procedure. Be sure to underline each of the materials listed above in your procedure. Your first titration should be a "scrap" titration without using the pH probe. The second titration must be done with great precision using the pH probe. Only consider the second titration when performing calculations and answering questions.
Note: Use 30.0 mL of unknown acid for each trial.

DO NOT DILUTE! STIR CONSTANTLY (**and GENTLY**) WITH PROBE.

Data: Record all pertinent data

Graph: Carefully create your titration curve using the pH probe set-up. After printing the graph, feel free to mark on it as necessary.

Calculations: Show all relevant calculations necessary to complete the purposes stated above.

Questions (Actually, just more calculations):
For #'s 1-5, compare your answers to pH values from your graph.
1) Using your calculated concentration, calculate the pH of the unknown acid prior to the titration.

2) Calculate the pH after 3.0 mL of 0.10 M NaOH were added to the unknown acid (use your calculated concentration and the accepted K_a value).

3) Calculate the pH at the halfway point of the titration (use your calculated concentration and the accepted K_a value -- also, you must show calculations for this question, and not simply state that $pH=pK_a$ at the halfway point).

4) Calculate the pH at the equivalence point of the titration (use your calculated concentration and the accepted K_a value).

5) Calculate the pH at 1.0 mL past the equivalence point (use your calculated concentration and the accepted K_a value).

6) Calculate the number of grams of the "sodium salt" (i.e. the conjugate base of this acid) which must be added to 100. mL of your acid sample in order to create a buffer pH of 4.20. (assume total volume is 100. mL, and use your calculated concentration and the accepted K_a value for the acid).

7) Clearly explain why phenolphthalein is a better indicator for this lab than bromocresol green. What would be the title of this lab if bromocresol green was the right indicator to use?

Error Analysis: Calculate your percent error for your concentration and for your K_a value. Discuss possible errors, which might have contributed to your error.

Conclusion: Begin your conclusion by clearly stating the concentration, the K_a, and the identity of your unknown acid as determined by you. Then write your conclusion as usual, summing up how you accomplished the purposes, and discussing the graphing and math used to accomplish them.