Ni Complex NH_3 Analysis/ Pre-lab Assignment
Name _____ Date _____ Lab Section _____

This week, you will analyze your Ni complex by reacting the amount of NH_3 in the complex with excess strong acid, HCl. The excess acid is then titrated with sodium hydroxide. In the space below, write balanced net ionic chemical equations for the following:

1. The reaction between ammonia and hydrochloric acid in solution.

2. The reaction of excess HCl with NaOH in solution.

3. The reaction of ammonium ion with water.

A sample 101 mg of a Ni^{2+} complex was dissolved in 35.01 mL of 0.1005 M HCl. The sample then required 13.49 mL of 0.1019 M NaOH to reach the endpoint. Answer the following questions about the complex.

Calculate the number of mmols of HCl added to the complex:

Calculate the number of mmols of NaOH added to the complex:

Calculate the number of mmols of NH_3 in the complex (mmol HCl – mmol NaOH):

Calculate the number of mg of NH_3 present in the complex (MM NH_3 = 17.03 mg/mmol):

What is the mass % NH_3 in this complex?

Using the table you prepared for the previous experiments with this complex, which complex is this? Provide the formula of the complex.

Analysis of your Ni^{2+}, NH_3, Cl^-, Complex: Analysis for NH_3 via Titration with Standardized HCl

You will analyze your Ni compound stoichiometry using titration. The analysis will be accomplished by adding more than enough HCl to react with all the ammonia and then titrating the excess HCl with NaOH using methyl red as an indicator to signal the endpoint. This procedure, termed 'back-titration', is common in chemical analysis.

Experimental Procedure

1. Analyze for ammonia by dissolving a 0.1 g of your compound (known to 0.1 mg decimal places) in 35 mL of standard 0.1 M HCl delivered from a buret (4 significant figures). The acid must be present in excess to convert virtually all of the NH_3 to the NH_4^+ ion.
2. Add 20 mL of distilled water and a few drops of methyl red indicator.
   Titrate with standard 0.1 M NaOH. If you don't have a red color initially it may be necessary to add another 5 mL of HCl (carefully measured with a buret).
   Be aware that methyl red fades over time to give a nearly colorless, pale green solution.
3. The number of moles of NH_3 in the sample is given by the difference between the moles of HCl added and the moles of NaOH required for the back titration.
4. Calculate the number of moles of NH_3 in your sample and the initial number of moles of your compound using the molar mass you calculated in experiment 9B. Is this result consistent with the nickel complex that you thought you had synthesized? The result that you obtained for molar mass by spectrophotometric analysis suggested a ratio, moles NH_3/moles compound, of 4, 5, or 6. What do these results suggest?
5. The end point is near a pH of 5. Why?
   (Hint: the solution at the endpoint is a solution of NH_4^+, not NH_3).

Note: Your notebook should have a conclusion for each part of this experiment (synthesis, spectral analysis, and stoichiometric analysis), and a final conclusion and discussion of which compound you think you have synthesized and why you have made this particular choice.