1. points – Calculate the $\boldsymbol{K_a}$ of a monoprotic acid if a 0.153 M solution of the acid has a pH of 6.649.

2. Ammonia, NH_3, is a base that ionizes to give NH_4^+ and OH^- ($K_b = 1.8\times10^{-5}$). You add magnesium sulfate to an ammonia solution. The concentration of Mg^{2+} ion when magnesium hydroxide, $Mg(OH)_2$, just begins to precipitate from 0.10 M NH_3 is 1.0×10^{-5} M. Calculate the value of $\boldsymbol{K_{sp}}$ for magnesium hydroxide.

3. Qualitative analysis.

a. Multiple Choice (circle the correct answer)

Which of the following ions forms a precipitate when aqueous Chloride ion is added?

Li^+ NH_4^+ Ag^+ Cu^{2+}

Which of the following ions gives a persistent bright yellow color in a flame test?

Li^+ NH_4^+ Na^+ K^+

Which of the following ions forms a red-maroon precipitate with $K_4Fe(CN)_6$?

Li^+ Ag^+ Cu^{2+} Cu^+

Which of the following ions can be precipitated with aqueous ammonia?

Cr^{3+} Li^+ Cu^{2+} Na^+

Which of the following can be used as a confirmation of the presence of Cu^{2+}?

$HCl_{(aq)}$ $K_4Fe(CN)_{6(aq)}$ $HNO_{3(aq)}$ $NH_{3(aq)}$

b. Separations
A solution contains Cu^{2+} and Cr^{3+} ions. Give one (***and only one***) test that will separate these two ions. State which ion is in which phase (supernatant or precipitate). Giving more than one test will result in zero points.

4. A solution is a mixture of 0.15 M Silver Nitrate and 0.26 M Barium Nitrate. A solution of Sodium Oxalate is added dropwise.
a. Which ion will precipitate first? (Show work, no points for lucky guesses)

b. What percent of the ion that precipitates first will remain in solution when the second metal ion starts to precipitate?

5. Calculate the ***pH*** of a solution that is obtained by combining 150.0 mL of 0.151 M Hydrazine with 200.0 mL of 0.096 M Nitric acid.

6. Does a precipitate form when 0.0456 g of Nickel(II) Nitrate is added to 250.0 mL of a solution that is 1.00 M Sodium Hydroxide and 2.00 M Sodium Cyanide? Show all work that leads you to your answer. No points for just a "yes" or "no" answer.