Iron Series

What is the name of the compound $Fe(NO_3)_3$?

Place 30 drops of 0.1 M $Fe(NO_3)_3$ in a clean, medium sized test-tube. What color is the aqueous solution of Fe(III)?

Add 5 drops of 2.0 M Na_2CO_3 to your test-tube and record your observations.

Using your reactions with copper as a guide, propose two possible precipitates for the reaction of $Fe(NO_3)_3$ and Na_2CO_3.

The actual precipitate in this case is iron(III) hydroxide. Write a balanced chemical equation that shows the formation of this precipitate.

Add eight drops of 3 M HCl to your test-tube and record your observations. Write a balanced equation for the reaction you observe.

As shown here, the thiocyante ion, SCN^-, forms a metal-ligand complex with Fe^{3+}

$$Fe^{3+}(aq) + SCN^-(aq) \rightarrow Fe(SCN)^n(aq)$$

where *n* is the complex ion's charge. What is the value of *n*?

Add 3 drops of 0.1 M KSCN to your test-tube and stir. What color is the iron(III) thiocyante complex ion?

Iron (III) also forms a complex ion with the fluoride ion, F^-. Because the iron(III)–fluoride complex is more stable that the iron(III)–thiocyante complex (you will learn why later this semester), the fluoride ion replaces the thiocyante ion. Add 20 drops of 1.0 M NaF to your test-tube and stir. What color is the iron (III)–fluoride complex? (Note: you might see a little bit of the sodium salt of this complex precipitating out of solution, but most of it should stay in solution).

Write a balanced chemical equation for the reaction of the iron(III)–thiocyante complex with the fluoride ion, assuming the iron(III)-fluoride complex has six fluoride ions for every Fe^{3+}.

Add 20 drops of 6.0 M NH_3. What do you observe? Write two balanced chemical equations for this reaction. Your first equation is an acid–base reaction that explains why a solution of ammonia contains hydroxide ion and your second chemical equation will show the reaction of OH^- ions with the iron(III)–fluoride complex ion.

This completes the series of reactions for iron. Discard the contents of your test-tubes and clean up!