

Chemistry - Laboratory #8: Silver/Lead Analysis Lab

ROUGH DRAFT pre-lab (goal through procedure) DUE FRIDAY, 12/9/11
FINAL DRAFT of lab (title through procedure) in lab book DUE TUESDAY, 12/13/11
LAB WILL BE ON Tuesday and Wednesday, December 13-14, 2011

Goal

The goal of this lab is to determine if an unknown sample contains Pb^{2+} ions, Ag^+ ions, both ions, or neither ion.

Research Questions

1. What are the chemical formulas for silver nitrate, potassium chromate, lead (II) nitrate, and hydrochloric acid?
2. What is a precipitate? Name two precipitates that will form in this lab.
3. What does it mean to decant? Name two things that can be decanted.
4. What is a centrifuge? How does it work? Include a small diagram of a centrifuge.
5. What is the chemistry definition of solubility? (Hint: it's quantitative.) Describe a step of this lab where solubility will be used.

Background and Introduction

Like many other ionic compounds, some ionic compounds of silver and lead are insoluble in water. When these are formed in solution by mixing chemicals, they come out of solution in the form of precipitates. The fact that only some silver and lead compounds form these precipitates allows these two ions to be separated based on these properties. Separating and detecting ions in this way is a branch of chemistry known as qualitative analysis.

In this particular case, you will use the following reactions to detect and possibly separate silver ions (Ag^+) and lead (II) ions (Pb^{2+}) [see flow chart on back page for another version]:

1. Silver ions will precipitate out of solutions as silver chloride (AgCl) and lead ions will precipitate out as lead (II) chloride (PbCl_2) when they are mixed with 6 M HCl.
2. PbCl_2 will react with very hot (near 100 °C) water, forming lead (II) hexahydrate ($[\text{Pb}(\text{H}_2\text{O})_6]^{2+}$), a complex ion that is soluble in water.
3. When a drop of potassium chromate (K_2CrO_4) is added to $[\text{Pb}(\text{H}_2\text{O})_6]^{2+}$, lead (II) chromate (PbCrO_4) solid will precipitate out.

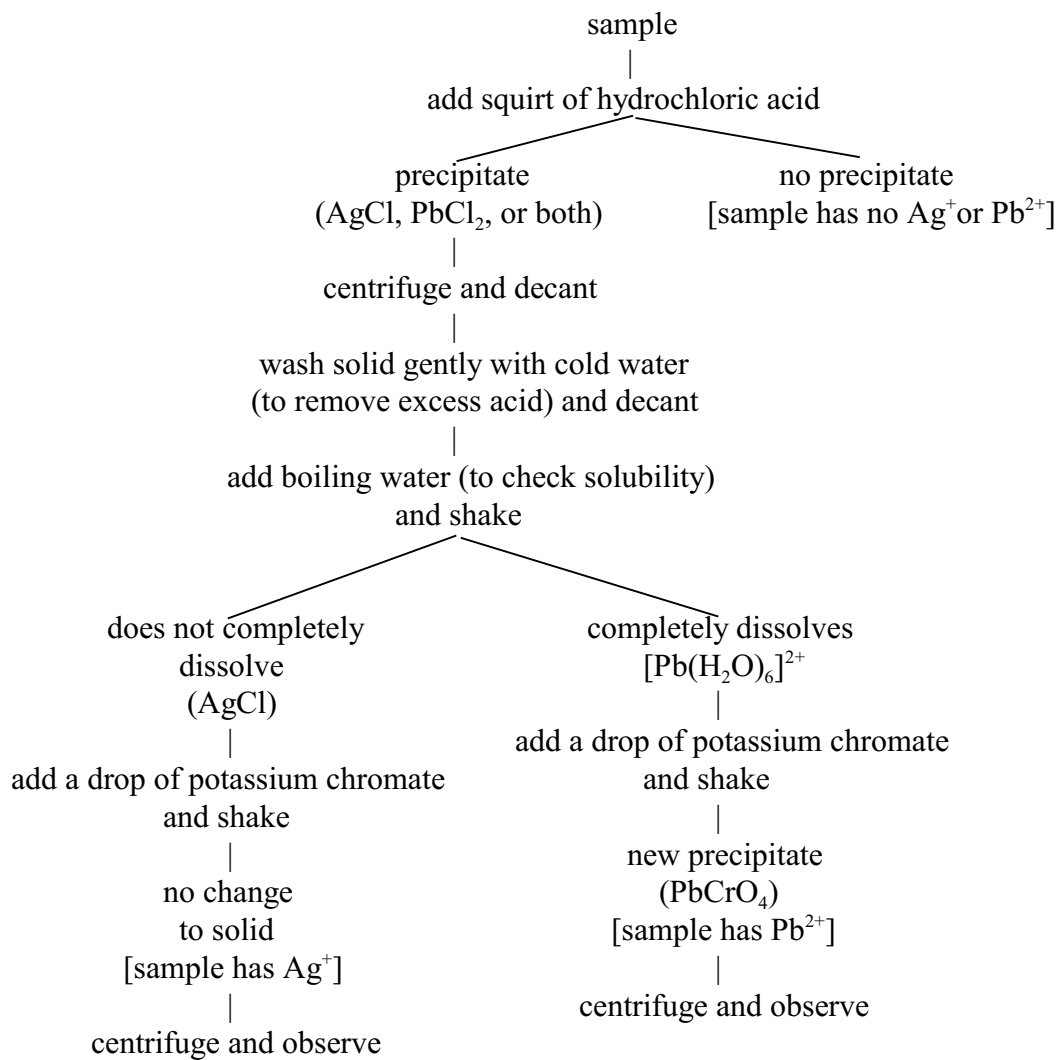
Guidelines

1. Run three known samples of (1) just Ag^+ ions, (2) just Pb^{2+} ions, and (3) a mix of both ions, plus your unknown.
2. Use all three reactions [described above and shown on the back of the handout] on each of the three known samples and your unknown.
3. You will have the following aqueous solutions available for your use:

0.1 M silver nitrate	0.1 M lead (II) nitrate
0.1 M potassium chromate	6 M hydrochloric acid
unknown solution	

(While we will be using droppers to get the chemicals and will not be measuring them, say you will use 5 mL of each in your materials section.)
4. Use 16 x 125 mm (centrifuge-size) test tubes.

Flow chart:



But what if the sample has both Ag^+ and Pb^{2+} ????