EXPERIMENT 15A

QUALITATIVE ANALYSIS: GROUP I (Ag^+, Hg_2^{2+}, Pb^{2+})

Carry out the procedures on a "known" solution that contains all of the Group I ions. Then obtain an **unknown** from your instructor and use the same procedures to determine the Group I ion(s) present.

PROCEDURES:

1. Add 10 drops of 6.0 M HC1 to 2.0 mL of the sample. A white precipitate will form if Group I ions are present.

Group I ion (aq) + $C1^-$(aq)→Group I Clorides (s) **Equation 15A.1**

Centrifuge the mixture and add another drop of HC1 to verify complete precipitation. If precipitation is complete proceed to the next step. If not, add 2 more drops of 6.0 M HC1, stir, centrifuge, and again test for completeness of precipitation. The supernatant must be free of Group I ions before moving on to the next step.

2. Decant and discard the supernatant. Add 2 mL distilled water to the precipitate and heat for 3 minutes in a hot water bath. Stir occasionally while heating. Any lead present in the precipitate (in the form of $PbC1_2$) will dissolve in the water as it becomes hot.

(cold) $PbC1_2$(s) $\xrightarrow{\Delta}$ Pb^{2+}(aq) + $2C1^-$(aq) (hot)

Toward the end of the heating period allow the remaining precipitate to settle to the bottom of the test tube giving a clear solution above. Turn off the heat if necessary to avoid agitation of the precipitate. When the supernatant is completely clear, draw off as much as possible into a pipette without picking up any of the precipitate and place the supernatant (still hot) in a separate test tube.

3. Allow the hot supernatant from Step 2 to cool, then add 2-3 drops of 1 M K_2CrO_4. A yellow precipitate confirms the presence of lead ion. A yellow precipitate means lead is present.

Pb^{2+}(aq) + CrO_4^{2-} (aq) → $PbCrO_4$ (s) (yellow) **Equation 15A.2**

Caution: Some white precipitate of $PbC1_2$ once more, could form as the solution cools. Look for yellow precipitate.

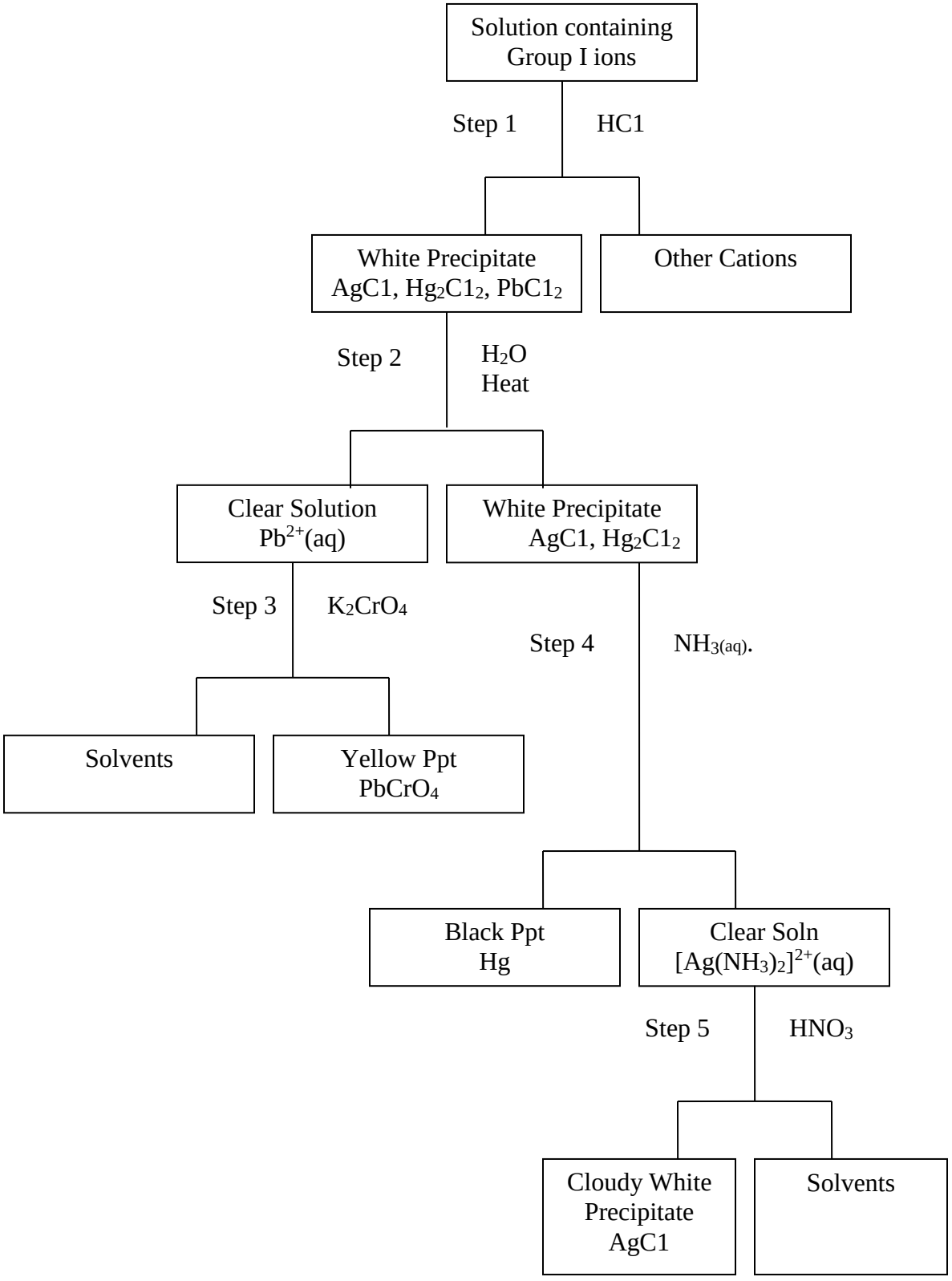
4. To the remaining precipitate of Step 2, add 10 drops of 4 M aqueous ammonia, $NH_{3\,(aq)}$. A black or dark grey residue (precipitate) confirms the presence of mercury.

Hg_2C1_2 (s) (white) + $2NH_3$(aq) → Hg(s) (black) + $HgNH_2C1$ (s) (white) + NH_4C1(aq) **Equation 15A.3**

5. Centrifuge the mixture from Step 4 and decant the clear supernatant into a separate test tube. Add 4 M HNO_3 until the solution is acidic (pH = 5 or less). The formation of a white precipitate (cloudiness) confirms the presence of silver.

$[Ag(NH_3)_2]^{2+}$ (aq) + $C1^-$ (aq) + $2HNO_3$ (aq) → AgC1(s) (white) + $2NH_4NO_3$ (aq) **Equation 15A.4**

EXPERIMENT 15A–GROUP I ANALYSIS–FLOW CHART



NAME _____ SECTION_____

EXPERIMENT 15A – GROUP I
REPORT SHEET

UNKNOWN NUMBER: _____ANALYSIS _____

YOUR FLOW CHART: **(Make the chart complete by showing all steps, even washings, all reagents at proper concentrations and their amounts, color of precipitates, and any other information that was interesting and/or important.)**