GROUP A CATIONS

Ag^+	Pb^{2+}	Hg_2^{2+}

Group A cations are precipitated out from the solution using small amounts of 6 M HCl since they are the only group that readily forms insoluble chloride salts:

$$Ag^+_{(aq)} + Cl^-_{(aq)} \rightleftharpoons AgCl_{(s)} \quad ; K_{sp} = 1.7 \times 10^{-10}$$

$$Pb^{2+}_{(aq)} + 2Cl^-_{(aq)} \rightleftharpoons PbCl_{2(s)} \quad ; K_{sp} = 1.6 \times 10^{-5}$$

$$Hg_2^{2+}_{(aq)} + 2Cl^-_{(aq)} \rightleftharpoons Hg_2Cl_{2(s)} \quad ; K_{sp} = 1.1 \times 10^{-18}$$

Pb^{2+}	➢ **Effect of temperature** - **Highly soluble in hot water** - Hot water bath will dissolve the $PbCl_2$ precipitates allowing separation from the other chloride precipitates ➢ **Confirmatory reagent:** 1 M KI - Production of yellow precipitates
Ag^+	➢ **Complex ion formation** - **Separated by adding 6 M NH_3** - AgCl reacts with ammonia to form a water-soluble silver-ammonia complex - Separated AgCl from Hg_2Cl_2 ➢ **Confirmatory reagent:** 6 M HNO_3 - Production of white precipitates
Hg_2^{2+}	➢ The mercurous ion is **unstable** ➢ **Two confirmatory reactions:** - Formation of the white "ammonolysis" product - Oxidation of white $HgNH_2Cl$ and reduction to black Hg - The black Hg covers up most of the white $HgNH_2Cl$, forming a black/gray mixture.