1. A solution contains 0.01 M Ag+, 0.04 M Hg22+ and 0.1 M Pb2+. NaCl is gradually added to precipitate the Ag+ as AgCl, the Hg22+ as Hg2Cl2, and the Pb2+ as PbCl2. Given the following Ksp values: AgCl (Ksp = 1.6 x 10-10); Hg2Cl2 (Ksp = 3.5 x 10-18); PbCl2 (Ksp = 2.4 x 10-4).

a) at what [Cl-] will precipitation of each salt begin. Start with the following UNBALANCED equations:

 i) AgCl (s) → Ag+ (aq) + Cl- (aq)

 ii) Hg2Cl2 (s) → Hg22+ (aq) + Cl- (aq)

 i) PbCl2 (s) → Pb2+ (aq) + Cl- (aq)

b) What is the concentration of Hg22+ in solution when AgCl begins to precipitate?

c) What are the concentrations of Ag+ and Hg22+ when Pb2+ begins to precipitate?

d) Discuss the suitability of fractional precipitation using NaCl for the separation of Ag+, Hg22+ and Pb2+.