Selected Answers to 'Gravimetric Chloride Determination'

1. Why is it necessary to bring crucibles to constant weight?
   a. Constant weight implies a reproducibly dry state of crucibles.
   b. This is necessary for the accurate determination of AgCl by difference.

2. Why add HNO\(_3\) to sample and wash solutions?
   a. Sample solution
   i. H\(^+\) removes HCO\(_3^-\) and other weak acids that would ppt w/ Ag\(^+\).
   b. Wash solution
      i. Ionic strength favors formation of larger AgCl aggregates.
      ii. H\(^+\) prevents absorption of CO\(_2\) and subsequent formation of AgHCO\(_3\) (s).

2. Why not add a large excess of AgNO\(_3\)?
   a. This is wasteful
   b. This will favor co-precipitation of AgNO\(_3\) with AgCl.

3. Why is precipitant added slowly?
   a. This prevents co-precipitation of AgNO\(_3\) with AgCl.
   b. This favors the formation of larger AgCl particles.

4. Why digest the AgCl ppt?
   a. Colloidal AgCl will pass through the filter!

5. Test for completeness of:
   a. AgCl ppt - add additional AgNO\(_3\) - ppt implies incomplete rxn.
   b. AgCl washing - collect washings in ttube, add HCl - ppt implies Ag\(^+\) still being rinsed away.

6. Why wash by decantation?
   a. Remove large volume of supernatant that has an excess of Ag\(^+\) quickly before filter flow is slowed by accumulating AgCl.
   b. Allows for complete rinsing of AgCl with HNO\(_3\) wash solution to remove adsorbed AgNO\(_3\).

7. Loss of sample on filtration is a common source of error.

8. What ions interfered?
   a. Cations - ones that ppt with Cl
      i. Hg(I)
      ii. Pb(I)
   b. Anions - ones that ppt with Ag\(^+\)
      i. Halides F\(^-\), Br\(^-\), I\(^-\)
      ii. Oxyanions - PO\(_4^{3-}\), oxalate, HCO\(_3^-\) etc.

9. What other substances can be analyzed as we ran the expmt?
   a. Halides F\(^-\), Br\(^-\), I\(^-\)
   b. Oxyanions - PO\(_4^{3-}\), oxalate, HCO\(_3^-\) etc.

10. Does coprecipitation of impurities always lead to high results?
    a. No: if the impurity is a cation that ppt's Cl that is less massive than Ag, then the %Cl will come out low.

11. Sunlight --> loss of Cl\(_2\) --> low results.

12. Coprecipitation of:
    a. Hg\(_2\)Cl\(_2\) --> high results because Hg is heavier than Ag
    b. PbCl\(_2\) --> low results because Pt is not twice as heavy as Ag
    c. AgNO\(_3\) --> high results because there is no Cl in AgNO\(_3\).
    d. NaCl --> low results because Na weighs much less than Ag.

13. NH\(_3\)(aq) + H\(_2\)O \(\rightarrow\) NH\(_4\)\(^+\) + OH\(^-\): aqueous ammonia is in equilibrium with ammonium hydroxide - this is a good solvent for AgCl.