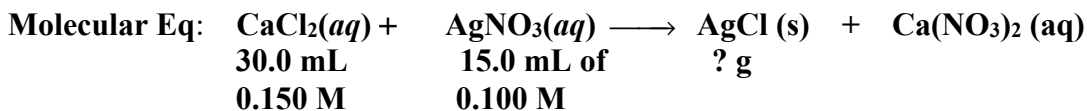


**Chem 2 Homework #4-6: Gravimetric Analysis (Problems from text pg. 155 # 76 – 80)
and Predicting Products Review**

4.76 Distilled water (not tap water) must be used in the gravimetric analysis of chlorides. Why?
Because tap water contains chloride ions that can interfere with the tests.

4.77 If 30.0 mL of 0.150 M CaCl₂ is added to 15.0 ml of 0.100 M AgNO₃, what is the mass in grams of AgCl precipitate?



Find Limiting reactant:

$$\text{mol Ag}^+ = \frac{0.100 \text{ mol Ag}^+}{1000 \text{ mL soln}} \times 15.0 \text{ mL soln} = 1.50 \times 10^{-3} \text{ mol Ag}^+$$

$$\text{mol Cl}^- = \frac{0.150 \text{ mol CaCl}_2}{1000 \text{ mL soln}} \times \frac{2 \text{ mol Cl}^-}{1 \text{ mol CaCl}_2} \times 30.0 \text{ mL soln} = 9.00 \times 10^{-3} \text{ mol Cl}^-$$

Since Ag⁺ and Cl⁻ combine in a 1:1 mole ratio, AgNO₃ is the limiting reagent. Only 1.50 × 10⁻³ mole of AgCl can form. Converting to grams of AgCl:

$$1.50 \times 10^{-3} \text{ mol AgCl} \times \frac{143.4 \text{ g AgCl}}{1 \text{ mol AgCl}} = \mathbf{0.215 \text{ g AgCl}}$$

**4.78 0.6760 g Ba²⁺ compound with excess Na₂SO₄ → 0.4105 g BaSO₄.
What is the mass % of Ba in the original compound?**



$$? \text{ mass of Ba} = 0.4105 \text{ g BaSO}_4 \times \frac{1 \text{ mol BaSO}_4}{233.4 \text{ g BaSO}_4} \times \frac{1 \text{ mol Ba}}{1 \text{ mol BaSO}_4} \times \frac{137.3 \text{ g Ba}}{1 \text{ mol Ba}} = 0.2415 \text{ g Ba}$$

$$\% \text{Ba by mass} = \frac{0.2415 \text{ g}}{0.6760 \text{ g}} \times 100\% = \mathbf{35.72\%}$$

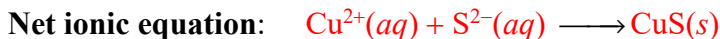
4.79 Mass of NaCl required to precipitate Ag⁺ from 2.50×10² mL of 0.0113 M AgNO₃?



$$\text{mol Ag}^+ = \frac{0.0113 \text{ mol Ag}^+}{1000 \text{ mL soln}} \times (2.50 \times 10^2 \text{ mL soln}) = 2.83 \times 10^{-3} \text{ mol Ag}^+$$

$$(2.83 \times 10^{-3} \text{ mol Ag}^+) \times \frac{1 \text{ mol Cl}^-}{1 \text{ mol Ag}^+} \times \frac{1 \text{ mol NaCl}}{1 \text{ mol Cl}^-} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = \mathbf{0.165 \text{ g NaCl}}$$

4.80 What is [Cu²⁺] in water sample if treatment of 800. mL of water with excess Na₂S yields 0.0177 g CuS(s)?

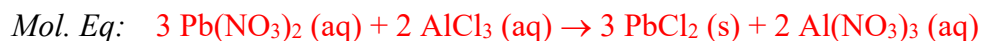


$$\text{mol Cu}^{2+} = 0.0177 \text{ g CuS} \times \frac{1 \text{ mol CuS}}{95.62 \text{ g CuS}} \times \frac{1 \text{ mol Cu}^{2+}}{1 \text{ mol CuS}} = 1.85 \times 10^{-4} \text{ mol Cu}^{2+}$$

$$[\text{Cu}^{2+}] = \frac{1.85 \text{ mol Cu}^{2+}}{0.800 \text{ L}} = \mathbf{2.31 \times 10^{-4} \text{ M}}$$

WKS: Predicting Products Review For each question, assume that a reaction takes place and write out the molecular equation and net ionic equation (if one can be written.) If asked, determine if reaction would occur and explain logic.

- 1) Aqueous lead(II) nitrate is added to aqueous aluminum chloride (*Is this a redox reaction?* No)



- 2) Calcium metal is added to water. (*Is this a redox reaction?* Yes)



Does this reaction occur? Yes *Explain how you know. Any of the following is good:*

- Ca is more easily oxidized than H₂ and Ca is a very reactive metal so forward reaction occurs.
- H₂O is more easily reduced than Ca²⁺ so forward reaction occurs

- 3) Silver wire is immersed in aqueous sulfuric acid. (*Is this a redox reaction?* Yes)



Does this reaction occur? No *Explain how you know.*

- Ag is harder to oxidize than H₂ so forward reaction does not occur.
- H⁺ is harder to reduce than Ag⁺ so forward reaction does not occur.

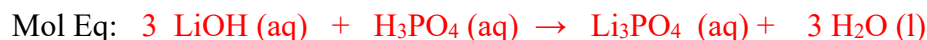
- 4) Chlorine gas is bubbled through an aqueous solution of potassium fluoride. (*Is this a redox rxn?* Yes)



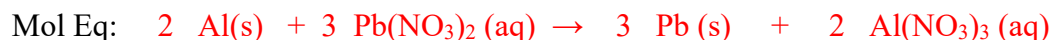
Does this reaction occur? No *Explain how you know.*

- Cl₂ is harder to reduce than F₂ so forward reaction does not occur.
- F⁻ is harder to oxidize than Cl⁻ so forward reaction does not occur.

- 5) An aqueous solution of lithium hydroxide is mixed with an aqueous solution of phosphoric acid. *Redox* No?



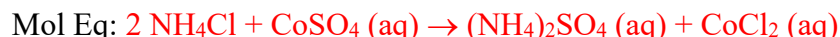
- 6) Aluminum metal is placed into an aqueous solution of lead (II) nitrate. (*Is this a redox rxn?* Yes)



Does this reaction occur? Yes *Explain how you know.*

- Al is easier to oxidize than Pb so forward reaction does occur.
- Pb²⁺ is easier to reduce than Al³⁺ so forward reaction does occur.

- 7) Aqueous solutions of ammonium chloride and cobalt(II) sulfate are mixed. (*Is this a redox rxn?* No)



Net Ionic: none possible. No reaction occurs because both “products” are soluble