Advanced Solution Calculations

1. Equal volumes of 0.120 mol/L potassium nitrate and 0.160 mol/L iron(III) nitrate are mixed together. What is the concentration of nitrate ions in the mixture?

2. Suppose that you want to remove the barium ions from 120 mL of 0.0500 mol/L aqueous barium nitrate solution. What is the minimum mass of sodium carbonate that you should add?

3. An excess of aluminum foil is added to a certain volume of 0.675 mol/L aqueous copper(II) sulfate solution. The mass of solid copper that precipitates is measured and found to be 4.88 g. What was the volume of the copper(II) sulfate solution?

4. To generate hydrogen gas, a student adds 5.77 g of mossy zinc to 80.1 mL of 4.00 mol/L hydrochloric acid in an Erlenmeyer flask. When the reaction is over, what is the concentration of aqueous zinc chloride in the flask?

5. Copper can be recovered from scrap metal by adding sulfuric acid. Soluble copper sulfate is formed. The copper sulfate then reacts with metallic iron in a single displacement reaction. To simulate this reaction, a student places 1.942 g of iron wool in a beaker that contains 136.3 mL of 0.0750 mol/L aqueous copper(II) sulfate. What mass of copper is formed?

6. Your stomach secretes hydrochloric acid to help you digest the food you have eaten. If too much HCl is secreted, however, you may need to take an antacid to neutralize the excess. One antacid product contains the compound magnesium hydroxide, $Mg(OH)_2$
a) Predict the reaction that takes place when magnesium hydroxide reacts with hydrochloric acid. (Hint: This is a double-displacement reaction.)
b) Imagine that you are a chemical analyst testing the effectiveness of antacids. If 0.10 mol/L HCl serves as your model for stomach acid, how many liters will react with an antacid that contains 0.10 g of magnesium hydroxide?

7. Even though lead is toxic, many lead compounds are still used as paint pigments (colouring). What volume of 1.50 mol/L lead(II) acetate contains 0.400 mol Pb^{2+} ions (lead(II) acetate is $Pb(C_2H_3O_2)_2$

Answers:

1.	0.300 M NO_3^{1-}		5.	0.650 g Cu
2.	0.636 g Na_2CO_3		6.	34.3 mL HCl
3.	113.8 mL $CuSO_4$		7.	267 mL $Pb(C_2H_3O_2)_2$
4.	1.101 M $ZnCl_2$			