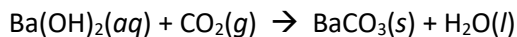# AP Worksheet 4a (Stoichiometry)

1. Calculate the mass of barium carbonate produced when excess carbon dioxide is bubbled through a solution containing 0.205 mol of barium hydroxide. *40.5 g*

$$Ba(OH)_2(aq) + CO_2(g) \rightarrow BaCO_3(s) + H_2O(l)$$

2. Calculate the molarity of ammonium hydroxide solution if 50.0 mL of it were reacted with excess aluminum chloride to produce 5.19 g of an aluminum hydroxide precipitate according to the reaction below. (Assume 100% yield.) *0.399 M*

$$3NH_4OH(aq) + AlCl_3(aq) \rightarrow 3NH_4Cl(aq) + Al(OH)_3(s)$$
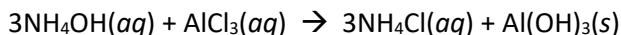
3. A 1.90 g sample of aluminum is placed in 150. mL of 1.00 M copper(II) chloride solution and allowed to react.
   a. Write the balanced equation for this reaction.
   b. Identify the limiting reactant. *Al*
   c. How many grams of solid copper should be formed in this reaction? *6.71 g*
   d. Suppose when this reaction took place that 6.32 g of solid copper was isolated. Determine the percent yield. *94.2%*
   e. Calculate the $[Cu^{2+}]$ (brackets indicate concentration, therefore $[Cu^{2+}]$ means the concentration of copper ions) after the reaction has completed. *0.296 M*

4. If 45.0 L of natural gas, which is essentially methane (CH_4), undergoes complete combustion at 730. mm Hg and 20.°C, how many grams of each product are formed? *79.2 g CO_2, 64.9 g H_2O*

5. Fritz Haber, a German chemist, discovered a way to synthesize ammonia gas (NH_3) by combining hydrogen and nitrogen gases at extremely high temperatures and pressures.

   a. Write the balanced equation for this reaction.
   b. If 10.0 kg of nitrogen combines with excess hydrogen at 550°C and 250 atm, what volume of ammonia gas is produced? *192 L*