CHEM 1364 (Night)
Quiz #3
Spring 2010 (Buckley)

1. (8 points) Carry out each of the following calculations. Be sure to show your work.

   a. How many moles of BaBr$_2$ are in 55.46-mL of 0.204 M BaBr$_2$ solution?

   \[
   \text{mol BaBr}_2 = \frac{0.5546 \text{L} \times 0.204 \text{M}}{1} = 0.113 \text{ mol BaBr}_2
   \]

   b. What volume of 0.453 M FeCl$_2$ could be prepared from 4.56-g of FeCl$_2$?

   \[
   \text{L} = \frac{4.56 \text{g FeCl}_2}{1 \text{ mol FeCl}_2} \times \frac{1 \text{ mol FeCl}_2}{136.8 \text{ g FeCl}_2} \times \frac{1 \text{ L}}{0.453 \text{ mol FeCl}_2} = 7.36 \times 10^{-2} \text{ L or 73.6 mL}
   \]

   c. What is the concentration of each ion in a solution of (NH$_4$)$_2$SO$_4$?

   \[\text{NH}_4^+ 2 \times 0.25 \text{ M IF THE CONCENTRATION HAD BEEN 0.25 M, THEN NH}_4^+ = 2 \times 0.25 \text{ M, SO}_4^{2-} = 0.25 \text{ M}\]

   d. How many grams of SrCl$_2$ are contained in 155.6-mL of 0.829 M SrCl$_2$?

   \[
   \text{g SrCl}_2 = \frac{0.1556 \text{L} \times 0.829 \text{ mol SrCl}_2 \times 155 \text{ g SrCl}_2}{1 \text{ L}} = 20.6 \text{ g SrCl}_2
   \]

Atomic Weights (may not need all of them):

Ba = 137   Br = 80   Fe = 55.8   Cl = 35.5   N = 14   S = 32   O = 16   Sr = 88
2. (8 points) For the following reaction:
   i. Write the correct products.
   ii. Indicate the state of the products (aq, s, l).
   iii. Balance the equation.
   iv. Write the complete ionic equation.
   v. Write the net ionic equation.

$$\text{BaCl}_2 \text{ (aq)} + (\text{NH}_4)_2 \text{SO}_4 \text{ (aq)} \rightarrow \text{BaSO}_4 \text{ (s)} + 2\text{NH}_4 \text{Cl (aq)}$$
$$\text{Ba}^{2+} + 2\text{Cl}^- \text{ (aq)} + 2\text{NH}_4^+ + \text{SO}_4^{2-} \text{ (aq)} \rightarrow \text{BaSO}_4 \text{ (s)} + 2\text{NH}_4^+ + 2\text{Cl}^- \text{ (aq)}$$
$$\text{Ba}^{2+} + \text{SO}_4^{2-} \text{ (aq)} \rightarrow \text{BaSO}_4 \text{ (s)}$$

3. (6 points) 25.00 mL of a H$_3$PO$_4$ solution requires 43.56-mL of a 0.1045 M KOH solution to reach the endpoint. What is the molarity of the H$_3$PO$_4$ solution? SHOW YOUR WORK.

$$\text{H}_3\text{PO}_4 \text{ (aq)} + 3\text{ KOH (aq)} \rightarrow \text{K}_3\text{PO}_4 \text{ (aq)} + 3\text{ HOH (l)}$$

$$\text{mol KOH} = 0.04356 \text{ L} \times \frac{0.1045 \text{ mol}}{1} = 0.04550 \text{ mol KOH}$$
$$\text{mol H}_3\text{PO}_4 = \frac{1}{3} \times \text{mol KOH} = \frac{1}{3} \times 0.04550 = 0.01517 \text{ mol H}_3\text{PO}_4$$
$$\text{Molarity H}_3\text{PO}_4 = \frac{0.01517 \text{ mol}}{0.025 \text{ L}} = 0.6069 \text{ M}$$

Atomic Weights (may not need all of them):

Ba = 137  Br = 80  Fe = 55.8  Cl = 35.5  N = 14  S = 32  O = 16  Sr = 88