General Chemistry
Mr. MacGillivray
Quiz #32:
Solution Stoichiometry

Problem: A student performed an experiment to determine the concentration of a solution of $Ba(NO_3)_2$. 40.0 ml of the barium nitrate solution required 25.0 ml of a K_2SO_4 solution in order to completely react. If the concentration of the potassium sulfate solution was 0.100 M, what was the concentration of the barium nitrate solution?

1. Balance the following equation:

$$\_\_\_\_Ba(NO_3)_2\,(aq) + \_\_\_\_K_2SO_4\,(aq) \rightarrow \_\_\_\_BaSO_4\,(s) + \underline{2}\,KNO_3\,(aq)$$

40.0 ml		25.0 ml
0.0625 M		0.100 M
0.00250 mol		0.00250 mol

2. Fill in the known quantities in the above table. No work needs to be shown.
3. Compute the number of moles of potassium sulfate that reacted. Fill in the answer in the above table. Show your work below.

$M = \frac{n}{V}$ $\quad n = MV = \left(0.100 \frac{mol}{L}\right)(0.0250\,L) = 0.00250\,mol\,K_2SO_4$

4. Compute the number of moles of barium nitrate that reacted. Fill in the answer in the above table. Show your work below.

$$0.00250\,mol\,K_2SO_4 \times \frac{1\,mol\,Ba(NO_3)_2}{1\,mol\,K_2SO_4} = 0.00250\,mol\,Ba(NO_3)_2$$

5. Compute the concentration of the barium nitrate solution. Fill in the answer in the above table. Show your work below.

$M = \frac{n}{V}$ $\quad M = \frac{0.00250\,mol}{0.0400\,L} = 0.0625\,M$

6. **How many ml** of a 0.175 M solution **of HCl** are required to completely react with 30.0 ml of a 0.200 M solution of $Ca(OH)_2$? Show your work! The balanced equation is given below.

$$Ca(OH)_2\,(aq) + 2\,HCl\,(aq) \rightarrow CaCl_2\,(s) + 2\,H_2O\,(l)$$

(a) $0.0300\,L \times \frac{0.200\,mol}{L} = 0.00600\,mol\,Ca(OH)_2$

(b) $0.00600\,mol\,Ca(OH)_2 \times \frac{2\,mol\,HCl}{1\,mol\,Ca(OH)_2} = 0.0120\,mol\,HCl$

(c) $M = \frac{n}{V} \Rightarrow V = \frac{n}{M}$

$V = \frac{0.0120\,mol}{0.175 \frac{mol}{L}} = 0.0686\,L = 68.6\,ml$