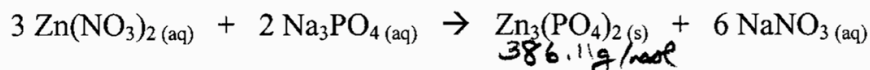


Stoichiometry 4

| Consider the following reaction carried out to prepare zinc phosphate in the lab.

Soln



A technician adds excess sodium phosphate solution to 5.00L of 0.100 M zinc nitrate solution.

A) What is the theoretical yield of solid zinc phosphate?

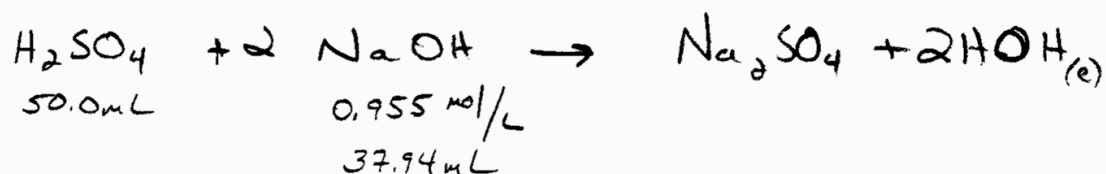
$$\frac{5.00 \cancel{\text{L}} \times 0.100 \text{ mol Zn}(\text{NO}_3)_2}{1 \cancel{\text{L}}} \times \frac{1 \text{ mol Zn}_3(\text{PO}_4)_2}{3 \text{ mol Zn}(\text{NO}_3)_2} \times \frac{386.11 \text{ g}}{1 \text{ mol}} = \boxed{64.4 \text{ g}}$$

B) If the process typically has a 97.0 % yield, what mass would the technician expect to obtain when the precipitate is fully purified?

$$0.970 = \frac{\text{AY}}{\text{TY}}$$

$$\text{AY} = \text{TY} \times 0.970 = (64.4 \text{ g})(0.97) = \boxed{62.4 \text{ g}}$$

2. What is the concentration (in mol/L) of a 50.0 mL sample of H_2SO_4 if 37.94 mL of 0.955 M NaOH solution is required to fully react with it?

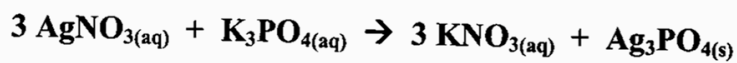


find mol H_2SO_4 :

$$\frac{0.03794 \text{ L} \times 0.955 \text{ mol NaOH}}{1 \text{ L}} \times \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol NaOH}} = 0.01812 \text{ mol H}_2\text{SO}_4$$

$$[\text{H}_2\text{SO}_4] = \frac{0.01812 \text{ mol H}_2\text{SO}_4}{0.0500 \text{ L}} = \boxed{0.362 \text{ M}}$$

3. What mass of solid silver phosphate can be produced by the mixing of 35.0 mL of a 0.775 M solution of silver nitrate with 55.0 mL of a 0.667 M solution of potassium phosphate?



↓
418.56 g/mol

$$\textcircled{2} \quad \frac{0.0350 \text{ L} \times 0.775 \text{ mol AgNO}_3}{1 \text{ L}} \times \frac{1 \text{ mol Ag}_3\text{PO}_4}{3 \text{ mol AgNO}_3} \times 418.56 \text{ g} = 3.78 \text{ g}$$

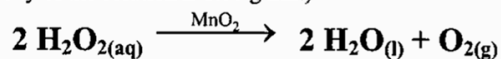
* AgNO_3 is the LR, theoretical yield:

$$= 3.78 \text{ g}$$

$$\frac{0.0550 \text{ L} \times 0.667 \text{ mol K}_3\text{PO}_4}{1 \text{ L}} \times \frac{1 \text{ mol Ag}_3\text{PO}_4}{1 \text{ mol K}_3\text{PO}_4} \times 418.56 \text{ g} = 15.4 \text{ g}$$

$$= 15.4 \text{ g}$$

4. Consider the catalytic decomposition of 250.0 mL of 3.00 % by mass hydrogen peroxide solution? (The density of the solution is 1.00 g/mL.)



A) What mass of the H_2O_2 is in the solution?

B) What volume of oxygen gas (at STP) should be produced by the reaction?

$$\text{A) } \frac{250.0 \text{ mL} \times 1.00 \text{ g/mL} \times 3.00 \text{ g H}_2\text{O}_2}{100 \text{ g}} = 7.5 \text{ g H}_2\text{O}_2$$

$$\text{B) } \frac{7.5 \text{ g H}_2\text{O}_2}{34.04 \text{ g/mol}} \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}_2} \times 22.4 \text{ L/mol} = 2.47 \text{ L}$$

$$= 2.47 \text{ L}$$