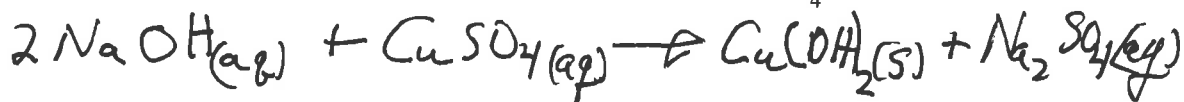


# KEY

## Solutions Worksheet (Solution Stoichiometry)

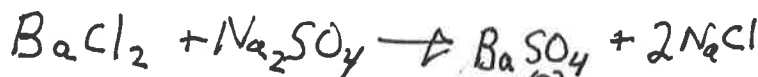
1. How many mL of 0.125M NaOH will react with 30.00 mL of 0.400M CuSO<sub>4</sub> solution?



$$\text{mL NaOH} = 30.00 \text{ mL CuSO}_4 \times \frac{0.400 \text{ mol CuSO}_4}{1000 \text{ mL Sol}} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol CuSO}_4} \times \frac{1000 \text{ mL NaOH}}{0.125 \text{ mol NaOH}}$$

$$= \underline{\underline{192 \text{ mL NaOH}}}$$

2. How many grams of barium sulfate will result from mixing 345 mL of 0.237 M sodium sulfate with 484 mL of 0.132 M barium chloride?



You need to recognize this is a limiting reagent problem.

BaCl<sub>2</sub> Path

$$\text{mol BaSO}_4 = \frac{0.132 \text{ mol BaCl}_2}{1000 \text{ mL Sol.}} \times 484 \text{ mL Sol.} \times \frac{1 \text{ mole BaSO}_4}{1 \text{ mole BaCl}_2} = 6.39 \times 10^{-2} \text{ BaSO}_4$$

Na<sub>2</sub>SO<sub>4</sub> Path

$$\text{mol BaSO}_4 = \frac{0.237 \text{ mol Na}_2\text{SO}_4}{1000 \text{ mL Sol.}} \times 345 \text{ mL Sol.} \times \frac{1 \text{ mol BaSO}_4}{1 \text{ mol Na}_2\text{SO}_4} = 8.18 \times 10^{-2} \text{ BaSO}_4$$

$$6.39 \times 10^{-2} < 8.18 \times 10^{-2} \therefore \text{BaCl}_2 \text{ is limiting}$$

$$\text{g BaSO}_4 = 6.39 \times 10^{-2} \text{ mole BaSO}_4 \times \frac{233.4 \text{ g}}{1 \text{ mole BaSO}_4} = \boxed{14.9 \text{ g BaSO}_4}$$

$$\text{molar mass BaSO}_4 = 233.4 \text{ g/mol}$$

3. If 25.0 mL of 0.0500M FeCl<sub>2</sub> solution are mixed with 5.00 mL of 0.200M K<sub>3</sub>PO<sub>4</sub> solution, how many grams of Fe<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> (s) will form?



FeCl<sub>2</sub> Path

$$\text{mol Fe}_3(\text{PO}_4)_2 = 25.0 \text{ mL FeCl}_2 \text{ Sol} \times \frac{0.0500 \text{ mol FeCl}_2}{1000 \text{ mL Sol}} \times \frac{1 \text{ mole Fe}_3(\text{PO}_4)_2}{3 \text{ mole FeCl}_2} = 4.167 \times 10^{-4} \text{ mol Fe}_3(\text{PO}_4)_2$$

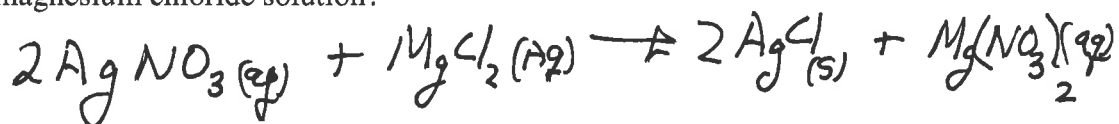
K<sub>3</sub>PO<sub>4</sub> Path

$$\text{mol Fe}_3(\text{PO}_4)_2 = 5.00 \text{ mL K}_3\text{PO}_4 \text{ Sol} \times \frac{0.200 \text{ mol K}_3\text{PO}_4}{1000 \text{ mL Sol}} \times \frac{1 \text{ mole Fe}_3(\text{PO}_4)_2}{2 \text{ mole K}_3\text{PO}_4} = 5.00 \times 10^{-4} \text{ mol Fe}_3(\text{PO}_4)_2$$

$4.17 \times 10^{-4} < 5.00 \times 10^{-4} \therefore \text{FeCl}_2$  is limiting

$$\text{g Fe}_3(\text{PO}_4)_2 = 4.167 \times 10^{-4} \text{ mole Fe}_3(\text{PO}_4)_2 \times \frac{357.5 \text{ g}}{1 \text{ mole Fe}_3(\text{PO}_4)_2} = 0.149 \text{ g Fe}_3(\text{PO}_4)_2$$

4. How many mL of 0.422 M silver nitrate will be necessary to precipitate all the chloride in 125 mL of 0.274 M magnesium chloride solution?



$$\text{mL AgNO}_3 = 125 \text{ mL MgCl}_2 \text{ Sol} \times \frac{0.274 \text{ mol MgCl}_2}{1000 \text{ mL}} \times \frac{2 \text{ mole AgNO}_3}{1 \text{ mole MgCl}_2} \times \frac{1000 \text{ mL}}{0.422 \text{ mol AgNO}_3}$$

$$= 162 \text{ mL AgNO}_3$$