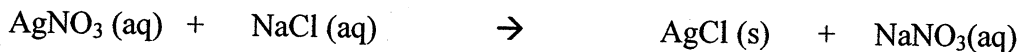


# Put answer key on-line

Solution stoichiometry - Calculations using molarity and a balanced chemical equation.

**Example 1:** You add 500 ml of 0.100 M  $\text{AgNO}_3$  solution to a solution containing an excess of  $\text{Cl}^-$  ion. How much  $\text{AgCl}$  precipitate will you form?

Molar masses:	169.88 g	58.44 g		143.32	85.00
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$$500 \text{ mL} = 0.500 \text{ L}$$

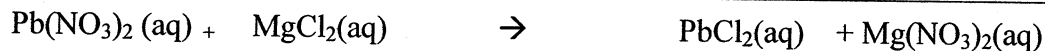
$$0.500 \text{ L} \times 0.1 \text{ M } \text{AgNO}_3 = 0.05 \text{ mol } \text{AgNO}_3$$

$$0.05 \text{ mol } \text{AgNO}_3 \times \frac{1 \text{ mol } \text{AgCl}}{1 \text{ mol } \text{AgNO}_3} = 0.0500 \text{ mol } \text{AgCl}$$

$$0.0500 \text{ mol } \text{AgCl} \times \frac{143.3 \text{ g } \text{AgCl}}{1 \text{ mol}} = 7.17 \text{ g } \text{AgCl}$$

**Example 2:** If you mix 200 ml of 0.100 M  $\text{Pb}(\text{NO}_3)_2$  and 300 ml of 0.200 M  $\text{MgCl}_2$ , how much  $\text{PbCl}_2$  precipitate will you form?

Molar masses:	331.22g	95.21 g		278.10 g	148.33 g
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$$200 \text{ mL } 0.100 \text{ M } \text{Pb}(\text{NO}_3)_2 =$$

$$0.200 \text{ L} \left( \frac{0.100 \text{ mol}}{\text{L}} \right) \text{Pb}(\text{NO}_3)_2 = 0.0200 \text{ mol } \text{Pb}(\text{NO}_3)_2 \times \frac{1 \text{ mol } \text{PbCl}_2}{1 \text{ mol } \text{Pb}(\text{NO}_3)_2} = 0.0200 \text{ mol } \text{PbCl}_2$$

$$300 \text{ mL } 0.200 \text{ M } \text{MgCl}_2 = 0.300 \text{ L} \left( \frac{0.200 \text{ mol}}{\text{L}} \right) \text{MgCl}_2 = 0.0600 \text{ mol } \text{MgCl}_2$$

$$0.0600 \text{ mol } \text{MgCl}_2 \times \left( \frac{1 \text{ mol } \text{PbCl}_2}{1 \text{ mol } \text{MgCl}_2} \right) = 0.0600 \text{ mol } \text{PbCl}_2$$

0.0200 mol  $\text{PbCl}_2$  is smaller therefore

$$0.0200 \text{ mol } \text{PbCl}_2 \times \frac{278.10 \text{ g } \text{PbCl}_2}{1 \text{ mol}} = 5.56 \text{ g } \text{PbCl}_2$$

Titration problems

**Example 3:** How many moles of water form when 25.0 mls of 0.100 M HNO<sub>3</sub> (nitric acid) solution is completely neutralized by NaOH (a base)?

Molar masses:	63.02 g	40.00 g		85.00 g	18.02 g
	HNO <sub>3</sub> (aq)	+ NaOH(aq)	→	NaNO <sub>3</sub> (aq)	+ H <sub>2</sub> O(l)

$$25.0 \text{ mL} = 0.025 \text{ L}$$

$$0.025 \text{ L} \left( \frac{0.100 \text{ mol}}{1 \text{ L}} \right) \text{HNO}_3 \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HNO}_3} = 0.0025 \text{ mol H}_2\text{O}$$

**Example 4:** What is the concentration (M) of a sulfuric acid solution, 125.0 mL of which required 37.5 mL of a 0.0125 M NaOH solution for neutralization

Molar masses:	98.08 g	40.00 g		142.04 g	18.02 g
	H <sub>2</sub> SO <sub>4</sub> (aq)	+ 2NaOH(aq)	→	Na <sub>2</sub> SO <sub>4</sub> (aq)	+ 2H <sub>2</sub> O(l)

$$37.5 \text{ mL} = 0.0375 \text{ L}$$

$$0.0375 \text{ L} \left( \frac{0.0125 \text{ mol NaOH}}{1 \text{ L}} \right) = 0.000469 \text{ mol NaOH}$$

$$0.000469 \text{ mol NaOH} \times \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol NaOH}} = 0.000235 \text{ mol H}_2\text{SO}_4$$

$$\frac{0.000235 \text{ mol H}_2\text{SO}_4}{0.125 \text{ L}} = 0.00188 \frac{\text{mol}}{\text{L}} \text{ H}_2\text{SO}_4$$

$$\frac{125 \text{ mL}}{1000} \rightarrow 0.125 \text{ L}$$