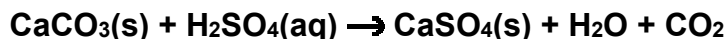# Solution Stoichiometry Problems

1. How many moles of calcium carbonate, $CaCO_3$, are required to react with the sulfuric acid in 375.4 mL of a 0.9734 M solution of H_2SO_4?
    (Atomic weights: Ca = 40.08, C = 12.01, O = 16.00).

$CaCO_3(s) + H_2SO_4(aq) \rightarrow CaSO_4(s) + H_2O + CO_2$

2. What mass of the active metal magnesium is required to react exactly with the hydrochloric acid in a 125.0 mL sample of a 0.2110 M solution of HCl?
    (Atomic weight: Mg = 24.305).

$Mg(s) + 2\ HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$
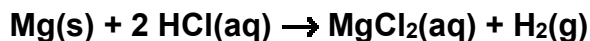
3. What mass of lead chromate, $PbCrO_4$, the pigment "chrome yellow", often used by artists, can be produced by addition of excess sodium chromate, Na_2CrO_4, to 25 mL of a 0.493 M solution of lead(II) nitrate, $Pb(NO_3)_2$?
    (Atomic weights: Pb = 207.2, Cr = 52.00, O = 16.00, Na = 22.99).

$Pb(NO_3)_2 + Na_2CrO_4 \rightarrow 2\ NaNO_3 + PbCrO_4$
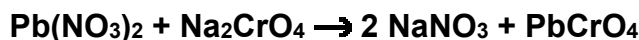
4. What volume, in mL, of 0.1130 M $AgNO_3$ is required to react with 10.00 mL of 0.09410 M K_2CrO_4 to form Ag_2CrO_4?
    (Atomic weights: Ag = 107.87, Cr = 52.00, K = 39.10, N = 14.01, O = 16.00).

$2\ AgNO_3 + K_2CrO_4 \rightarrow Ag_2CrO_4 + 2\ KNO_3$
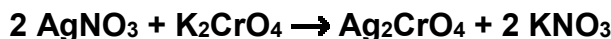
5. What volume, in mL, of 0.00927 M $LaCl_3$ is required to react with 13.95 mL of 0.0225 M sodium oxalate?
    (Atomic weights: La = 138.0, Cl = 35.45, Na = 22.99, H = 1.008, C = 12.01, O = 16.00).

$2\ LaCl_3 + 3\ Na_2C_2O_4 \rightarrow 2\ La_2(C_2O_4)_3 + 3\ NaCl$

6. An excess of silver nitrate, $AgNO_3$, reacts with 25.00 mL of a solution of calcium chloride, $CaCl_2$, producing calcium nitrate, $Ca(NO_3)_2$ and 4.498 g of silver chloride, AgCl. What is the molarity of the $CaCl_2$ solution?
    (Atomic weights: Ag = 107.87, Cl = 35.45).

7. Citric acid is a triprotic acid that reacts according to the following reaction. What is the molarity of a citric acid if 10.00 mL requires 35.59 mL of 0.312 M sodium hydroxide solution?
    (Atomic weights: C = 12.01, H = 1.008, Na = 23.0, O = 16.00).

$3\ NaOH + H_3C_6H_5O_7 \rightarrow Na_3C_6H_5O_7 + 3\ H_2O$