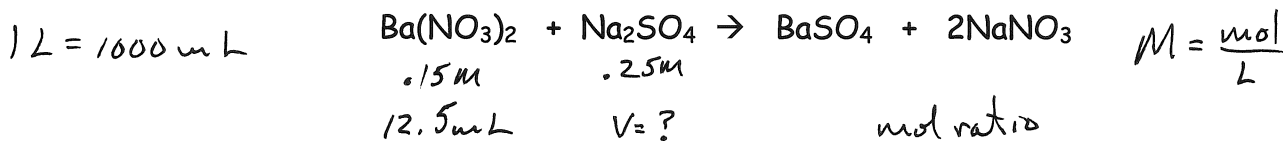


Key

Honors Solutions Stoichiometry

1. What volume (in mL) of 0.25 M Na_2SO_4 solution is needed to precipitate all the barium, as $\text{BaSO}_4(\text{s})$ from 12.5 mL of 0.15 M $\text{Ba}(\text{NO}_3)_2$ solution?

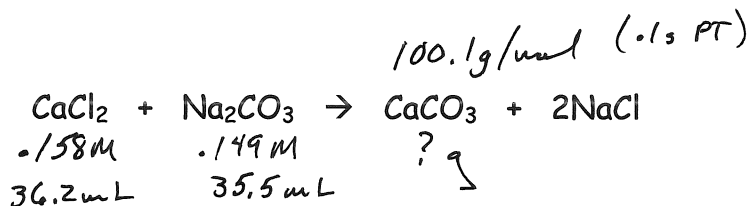


$$\frac{.15 \text{ mol Ba}(\text{NO}_3)_2}{\text{L}} \times \frac{12.5 \text{ mL}}{1000 \text{ mL}} \times \frac{1 \text{ L}}{1 \text{ mol Ba}(\text{NO}_3)_2} \times \frac{1 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol Ba}(\text{NO}_3)_2} \times \frac{\text{L}}{.25 \text{ mol}} = \boxed{.0075 \text{ L} \text{ or } 7.5 \text{ mL of } .25 \text{ M Na}_2\text{SO}_4}$$

molar ratio

2. If 36.2 mL of 0.158 M CaCl_2 solution is added to 37.5 mL of 0.149 M Na_2CO_3 , what mass of calcium carbonate, CaCO_3 , will be precipitated? The reaction

"LIMITED" is ...
Reaction



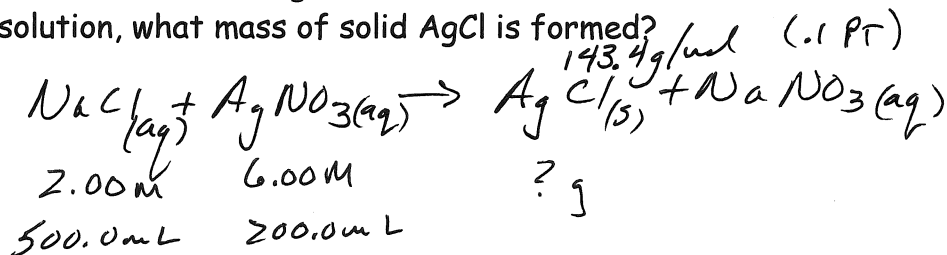
$$\frac{.158 \text{ mol CaCl}_2}{\text{L}} \times \frac{36.2 \text{ mL}}{1000 \text{ mL}} \times \frac{1 \text{ L}}{1 \text{ mol CaCl}_2} \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol CaCl}_2} = .005719 \text{ mol CaCO}_3$$

$$\frac{.149 \text{ mol Na}_2\text{CO}_3}{\text{L}} \times \frac{37.5 \text{ mL}}{1000 \text{ mL}} \times \frac{1 \text{ L}}{1 \text{ mol Na}_2\text{CO}_3} \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol Na}_2\text{CO}_3} = .0055875 \text{ mol CaCO}_3$$

smaller

3. If 200.0 mL of 6.00 M AgNO_3 solution is combined with 500.0 mL of 2.00 M NaCl solution, what mass of solid AgCl is formed?

"LIMITED"

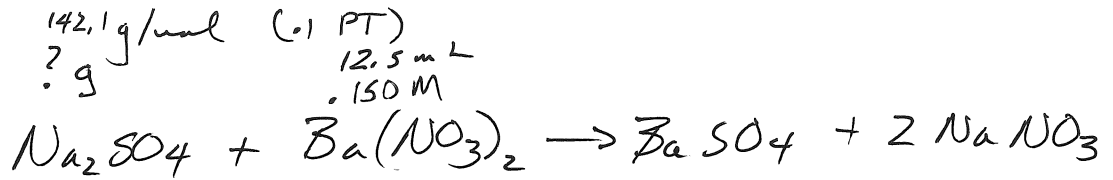


$$\frac{2.00 \text{ mol NaCl}}{\text{L}} \times \frac{500.0 \text{ mL}}{1000 \text{ mL}} \times \frac{1 \text{ L}}{1 \text{ mol NaCl}} \times \frac{1 \text{ mol AgCl}}{1 \text{ mol NaCl}} = 1.000 \text{ mol AgCl}$$

smaller

$$\frac{6.00 \text{ mol AgNO}_3}{\text{L}} \times \frac{200.0 \text{ mL}}{1000 \text{ mL}} \times \frac{1 \text{ L}}{1 \text{ mol AgNO}_3} \times \frac{1 \text{ mol AgCl}}{1 \text{ mol AgNO}_3} = 1.200 \text{ mol AgCl}$$

$$\boxed{143 \text{ g AgCl}}$$



4. What mass (in grams) of solid sodium sulfate would need to be added to 12.5 mL of 0.150 M barium nitrate solution to precipitate all of the barium as the compound barium sulfate.

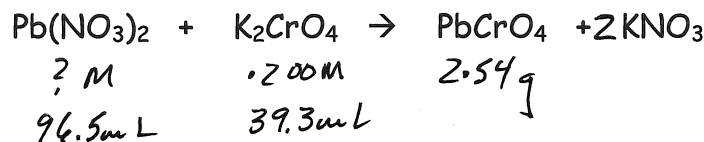
Need to match the moles of Na_2SO_4 with $\text{Ba}(\text{NO}_3)_2$

$$\frac{0.150 \text{ mol}}{\text{L}} \times \frac{12.5 \text{ mL}}{1000 \text{ mL}} \times \frac{1 \text{ L}}{1 \text{ mol Ba}(\text{NO}_3)_2} \times \frac{1 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol Ba}(\text{NO}_3)_2} \times \frac{142.1 \text{ g}}{\text{mol}} = \boxed{0.226 \text{ g Na}_2\text{SO}_4}$$

5. When a solution of lead (II) nitrate reacts with a potassium chromate solution a solid product, lead (II) chromate, forms according to the equation below.

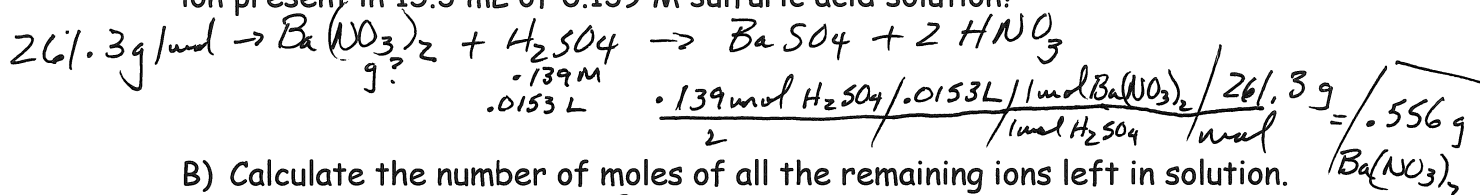
If 2.54 g of PbCrO_4 forms from the mixing of 39.3 mL of 0.200 M K_2CrO_4 and 96.5 mL of the lead (II) nitrate solution (assume both reactants will run-out simultaneously).

Balance!



$$\frac{0.200 \text{ mol K}_2\text{CrO}_4}{\text{L}} \times \frac{0.0393 \text{ L}}{1 \text{ mol K}_2\text{CrO}_4} \times \frac{1 \text{ mol Pb}(\text{NO}_3)_2}{1 \text{ mol K}_2\text{CrO}_4} \times \frac{0.0965 \text{ L}}{0.0965 \text{ L}} = \boxed{0.815 \frac{\text{mol Pb}(\text{NO}_3)_2}{\text{L}} \text{ M}}$$

6. A) How many grams of $\text{Ba}(\text{NO}_3)_2$ are required to precipitate all the sulfate ion present in 15.3 mL of 0.139 M sulfuric acid solution?



- B) Calculate the number of moles of all the remaining ions left in solution.

$$\frac{0.139 \text{ mol}}{\text{L}} \times \frac{0.0153 \text{ L}}{1 \text{ mol}} = \text{moles of H}_2\text{SO}_4 = 0.0021267$$

$$2 \text{ H}^+ = 0.0042534 \text{ mol}$$

$$\frac{0.0042534 \text{ mol}}{0.0153 \text{ L}} = 0.278 \text{ M H}^+$$

- C) Calculate the concentration in M of all the remaining ions left in solution.

$$\text{NO}_3^- \text{ M} = 0.278$$

$$\text{H}^+ \text{ M} = 0.278^2$$

(Note: 2X molarity of the $\text{Ba}(\text{NO}_3)_2$)