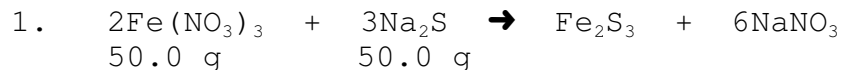


Limiting Excess Reagent Problems - Answers



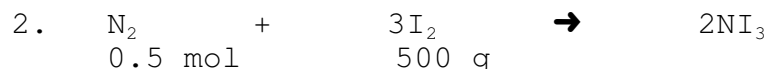
Consider from the point of view of iron(III) nitrate:

$$50.0 \text{ g Fe}(\text{NO}_3)_3 \times \frac{1 \text{ mol Fe}(\text{NO}_3)_3}{241.86 \text{ g Fe}(\text{NO}_3)_3} \times \frac{1 \text{ mol Fe}_2\text{S}_3}{2 \text{ mol Fe}(\text{NO}_3)_3} \times \frac{207.89 \text{ g Fe}_2\text{S}_3}{1 \text{ mol Fe}_2\text{S}_3} = 21.5 \text{ g Fe}_2\text{S}_3$$

Consider from the point of view of sodium sulphide:

$$50.0 \text{ g Na}_2\text{S} \times \frac{1 \text{ mol Na}_2\text{S}}{78.05 \text{ g Na}_2\text{S}} \times \frac{1 \text{ mol Fe}_2\text{S}_3}{3 \text{ mol Na}_2\text{S}} \times \frac{207.89 \text{ g Fe}_2\text{S}_3}{1 \text{ mol Fe}_2\text{S}_3} = 44.4 \text{ g Fe}_2\text{S}_3$$

therefore the maximum possible mass of Fe_2S_3 is 21.5 g



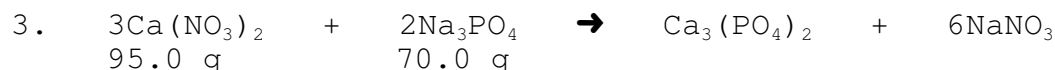
Consider from the point of view of N_2 :

$$0.5 \text{ mol N}_2 \times \frac{2 \text{ mol NI}_3}{1 \text{ mol N}_2} \times \frac{394.72 \text{ g NI}_3}{1 \text{ mol}} = 394.72 \text{ g NI}_3$$

Consider from the point of view of I_2 :

$$500 \text{ g I}_2 \times \frac{1 \text{ mol I}_2}{253.81 \text{ g I}_2} \times \frac{2 \text{ mol NI}_3}{3 \text{ mol I}_2} \times \frac{394.72 \text{ g NI}_3}{1 \text{ mol}} = 518.39 \text{ g NI}_3$$

therefore the max possible mass of NI_3 is 394.72 g



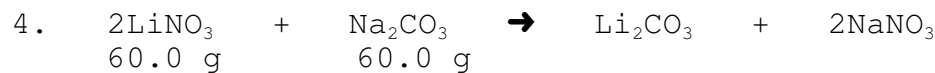
Consider from the point of view of $\text{Ca}(\text{NO}_3)_2$

$$95.0 \text{ g Ca}(\text{NO}_3)_2 \times \frac{1 \text{ mol Ca}(\text{NO}_3)_2}{164.10 \text{ g Ca}(\text{NO}_3)_2} \times \frac{1 \text{ mol Ca}_3(\text{PO}_4)_2}{3 \text{ mol Ca}(\text{NO}_3)_2} \times \frac{310.18 \text{ g Ca}_3(\text{PO}_4)_2}{1 \text{ mol Ca}_3(\text{PO}_4)_2} = 59.86 \text{ g Ca}_3(\text{PO}_4)_2$$

Consider from the point of view of Na_3PO_4

$$70.0 \text{ g Na}_3\text{PO}_4 \times \frac{1 \text{ mol Na}_3\text{PO}_4}{163.94 \text{ g Na}_3\text{PO}_4} \times \frac{1 \text{ mol Ca}_3(\text{PO}_4)_2}{2 \text{ mol Na}_3\text{PO}_4} \times \frac{310.18 \text{ g Ca}_3(\text{PO}_4)_2}{1 \text{ mol Ca}_3(\text{PO}_4)_2} = 66.2 \text{ g Ca}_3(\text{PO}_4)_2$$

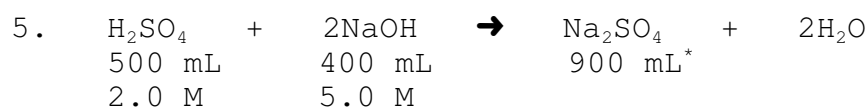
therefore the max possible mass of $\text{Ca}_3(\text{PO}_4)_2$ is 59.86 g



$$60.0 \text{ g LiNO}_3 \times \frac{1 \text{ mol LiNO}_3}{68.95 \text{ g LiNO}_3} \times \frac{1 \text{ mol Li}_2\text{CO}_3}{2 \text{ mol LiNO}_3} \times \frac{73.89 \text{ g Li}_2\text{CO}_3}{1 \text{ mol Li}_2\text{CO}_3} = 32.1 \text{ g Li}_2\text{CO}_3$$

$$60.0 \text{ g Na}_2\text{CO}_3 \times \frac{1 \text{ mol Na}_2\text{CO}_3}{105.99 \text{ g Na}_2\text{CO}_3} \times \frac{1 \text{ mol Li}_2\text{CO}_3}{1 \text{ mol Na}_2\text{CO}_3} \times \frac{73.89 \text{ g Li}_2\text{CO}_3}{1 \text{ mol Li}_2\text{CO}_3} = 41.8 \text{ g Li}_2\text{CO}_3$$

therefore the maximum possible mass of Li_2CO_3 is 32.1 g



Consider the point of view of H_2SO_4 :

$$\begin{array}{l} n = ? \\ C = 2.0 \text{ M} \\ V = 500 \text{ mL} \rightarrow 0.5 \text{ L} \\ \\ n = CV \\ n = 2.0 \frac{\text{mol}}{\text{L}} \times 0.5 \text{ L} \\ n = 1.0 \text{ mol H}_2\text{SO}_4 \end{array}$$

$$1.0 \text{ mol H}_2\text{SO}_4 \times \frac{1 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol H}_2\text{SO}_4} = 1.0 \text{ mol Na}_2\text{SO}_4$$

$$\begin{array}{l} n = 1.0 \text{ mol Na}_2\text{SO}_4 \\ C = ? \\ V = 900 \text{ mL} \rightarrow 0.9 \text{ L}^* \\ (500 \text{ mL} + 400 \text{ mL})^* \\ \\ C = \frac{n}{V} \\ C = \frac{1.0 \text{ mol}}{0.9 \text{ L}} \\ C = 1.11 \text{ M} \end{array}$$

Consider the point of view of NaOH :

$$\begin{array}{l} n = ? \\ C = 5.0 \text{ M} \\ V = 400 \text{ mL} \rightarrow 0.4 \text{ L} \\ \\ n = CV \\ n = 5.0 \frac{\text{mol}}{\text{L}} \times 0.4 \text{ L} \\ n = 2.0 \text{ mol NaOH} \end{array}$$

$$2.0 \text{ mol NaOH} \times \frac{1 \text{ mol Na}_2\text{SO}_4}{2 \text{ mol NaOH}} = 1.0 \text{ mol Na}_2\text{SO}_4$$

$$\begin{array}{l} n = 1.0 \text{ mol Na}_2\text{SO}_4 \\ C = ? \\ V = 900 \text{ mL} \rightarrow 0.9 \text{ L}^* \\ (500 \text{ mL} + 400 \text{ mL})^* \\ \\ C = \frac{n}{V} \\ C = \frac{1.0 \text{ mol}}{0.9 \text{ L}} \\ C = 1.11 \text{ M} \end{array}$$

Therefore the maximum possible concentration of sodium sulphate would be 1.11 M. This mixture is an optimum mixture given equal answers!!