

LIMITING REAGENT

- runs out first
- limits the amount of product you can make

Excess reagent → some left over

acetone



If I start with 100g of each reactant

- How many grams of CO_2 are produced?
- What is the limiting reagent?
- How many grams of the excess reagent remains when the reaction ceases?

$$100g C_3H_6O \times \frac{1 \text{ mol}}{58.09 \text{ g}} \times \frac{3 \text{ mol } CO_2}{1 \text{ mol } C_3H_6O} = 5.16 \text{ mol } CO_2$$

$$100g O_2 \times \frac{1 \text{ mol}}{32 \text{ g}} \times \frac{3 \text{ mol } CO_2}{4 \text{ mol } O_2} = 2.34 \text{ mol } CO_2$$

LR = O_2

$$2.34 \text{ mol } CO_2 \times \frac{44.01 \text{ g}}{1 \text{ mol}} = 102.98 \text{ g } CO_2$$

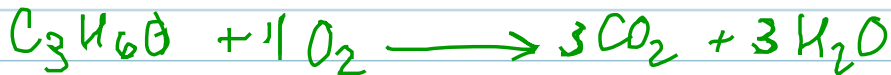
5.16 mol CO_2 could have made
 - 2.34 mol CO_2 actually made *left over*
 $\frac{2.82 \text{ mol } CO_2}{3 \text{ mol } CO_2} \text{ not made} \times \frac{1 \text{ mol } C_3H_6O}{3 \text{ mol } CO_2} \times \frac{58.09 \text{ g}}{1 \text{ mol}}$
 $= 54.60 \text{ g } C_3H_6O$

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If I start with 100g of each reactant

a) How many grams of CO_2 are produced?

b) What is the limiting reagent?

c) How many grams of the excess reagent remains when the reaction ceases?

$$100\text{g C}_3\text{H}_6\text{O} \times \frac{1 \text{ mol}}{58.09 \text{ g}} \times \frac{3 \text{ mol CO}_2}{1 \text{ mol C}_3\text{H}_6\text{O}} = 5.16 \text{ mol CO}_2$$

$$100\text{g O}_2 \times \frac{1 \text{ mol}}{32 \text{ g}} \times \frac{3 \text{ mol CO}_2}{4 \text{ mol O}_2} = \boxed{2.34 \text{ mol CO}_2}$$

LR = O_2

$$2.34 \text{ mol CO}_2 \times \frac{44.01 \text{ g}}{1 \text{ mol}} = \boxed{102.98 \text{ g CO}_2}$$

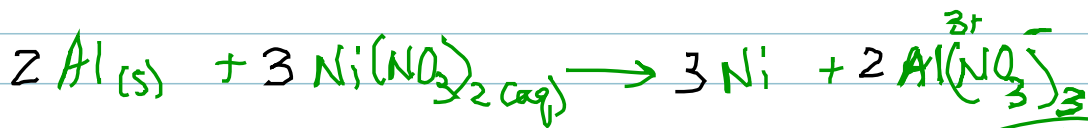
5.16 mol CO_2 could have made

- 2.34 mol CO_2 actually made

~~2.82 mol CO_2 not made~~

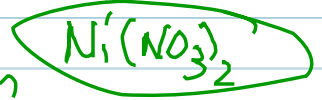
$$\times \frac{1 \text{ mol C}_3\text{H}_6\text{O}}{3 \text{ mol CO}_2} \times \frac{58.09 \text{ g}}{1 \text{ mol}}$$

$$= \boxed{54.60 \text{ g C}_3\text{H}_6\text{O}}$$



0.75g 150 mL 0.20M
 $\text{Ni(NO}_3)_2$

- a) LR = ?
 b) # g Ni = ?



c) how much excess

$$0.75 \text{ g Al} \times \frac{1 \text{ mol}}{26.98 \text{ g}} \times \frac{3 \text{ mol Ni}}{2 \text{ mol Al}} = 0.042 \text{ mol Ni}$$

$$\text{mol} = M \times L = (0.20 \text{ M})(0.15 \text{ L}) = 0.03 \text{ mol Ni(NO}_3)_2 \times \frac{3 \text{ mol Ni}}{3 \text{ mol Ni(NO}_3)_2}$$

$$\begin{array}{r} 0.042 \text{ mol Ni} \\ - 0.03 \text{ mol Ni} \\ \hline 0.012 \text{ mol Ni} \end{array} \times \frac{7 \text{ mol Al}}{3 \text{ mol Ni}}$$

$$\begin{array}{l} = 0.03 \text{ mol Ni} \times \frac{58.69 \text{ g}}{1 \text{ mol}} \\ \hline = 1.76 \text{ g Ni} \end{array}$$

$$= 0.008 \text{ mol Al} \times \frac{26.98 \text{ g}}{1 \text{ mol}} = 0.22 \text{ g Al left over}$$