LIMITING REAGENT

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

Excess reagent → some left over

acetone

$$C_3H_6O + 4\,O_2 \longrightarrow 3\,CO_2 + 3\,H_2O$$

If I start with 100 g 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?

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

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

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 (leftover)

$$2.82\text{ mol } CO_2 \times \frac{1\text{ mol } C_3H_6O}{3\text{ mol } CO_2} \times \frac{58.09}{1\text{ mol}} = 54.60\text{ g } C_3H_6O$$

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$$= 54.60\ g\ C_3H_6O$$

$2Al_{(s)} + 3Ni(NO_3)_{2\,(aq)} \rightarrow 3Ni + 2Al^{3+}(NO_3^-)_3$

$Ni(NO_3)_2$

0.75 g Al 150 mL 0.20 M $Ni(NO_3)_2$

a) LR = ?

b) # g Ni = ?

c) how much excess

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

$$mol = M \times L = (0.20M)(0.15L) = 0.03\ mol\ Ni(NO_3)_2 \times \frac{3\ mol\ Ni}{3\ mol\ Ni(NO_3)_2}$$

$= 0.03\ mol\ Ni \times \frac{58.69\ g}{1\ mol}$

$= 1.76\ g\ Ni$

$0.042\ mol\ Ni - 0.03\ mol\ Ni = 0.012\ mol\ Ni \times \frac{2\ mol\ Al}{3\ mol\ Ni}$

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