Limiting Reactant - reactant that limits the amount of product that can be formed

8 car bodies + 40 tires → 32 cars + 8 extra tires (excess reactant)

4 x 8 tires = 32

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ex)

$$Cu_{(s)} + 4HNO_{3(aq)} \rightarrow Cu(NO_3)_{2(aq)} + 2NO_{2(g)} + 2H_2O_{(l)}$$

0.125 mol — 0.125 mol — ___ mol

run both to product:

$$0.125 \text{ mol } Cu \left(\frac{2 \text{ mol } H_2O}{1 \text{ mol } Cu}\right) = 0.250 \text{ mol } H_2O$$

L Reactant

$$0.125 \text{ mol } HNO_3 \left(\frac{2 \text{ mol } H_2O}{4 \text{ mol } HNO_3}\right) = 0.0625 \text{ mol } H_2O$$

less product

$$1.50 \text{ g } Cu \left(\frac{1 \text{ mol } Cu}{63.55 \text{ g}}\right)\left(\frac{2 \text{ mol } NO_2}{1 \text{ mol } Cu}\right)\left(\frac{46.01 \text{ g}}{1 \text{ mol } NO_2}\right) = 2.17 \text{ g } NO_2$$

$$2.00 \text{ g } HNO_3 \left(\frac{1 \text{ mol } HNO_3}{63.02 \text{ g}}\right)\left(\frac{2 \text{ mol } NO_2}{4 \text{ mol } HNO_3}\right)\left(\frac{46.01 \text{ g}}{1 \text{ mol } NO_2}\right) = 0.730 \text{ g } NO_2$$

LR — less product

You react 1.50 g Cu w/ 2.00 g HNO_3 and produce 0.600 g NO_2 gas

Find % yield!

$$\%\,Y = \frac{0.600 \text{ g}}{0.730 \text{ g}} \times 100 = \boxed{82.2\%\ Y}$$

(0.600 g: lab; 0.730 g: theo)