

# Chapter 9 Calculations From Chem Eq.

TODAY'S  
DATE

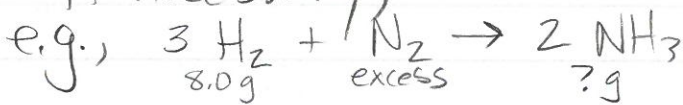
9.1-9.4 stoichiometry

stoichiometry is the study of quantitative relations btwn amounts of reactants + products e.g., chemists can find amounts of products or reactants

strategy for solving stoich. problems (basic)

problem-solving steps

- 1) write out and balance the chem rxn's equation
- 2) determine the # of moles of starting substance
- 3) use the mole ratio, from the balanced chem eq. to convert from moles of known to moles of unknown (convert to grams if necessary)



$$8.0 \text{g H}_2 \times \frac{1 \text{ mol H}_2}{2.016 \text{g H}_2} \times \frac{2 \text{ mol NH}_3}{3 \text{ mol H}_2} \times \frac{17.032 \text{g NH}_3}{1 \text{ mol NH}_3} = 45. \text{g NH}_3$$

molar mass                      mole ratio                      molar mass

9.5

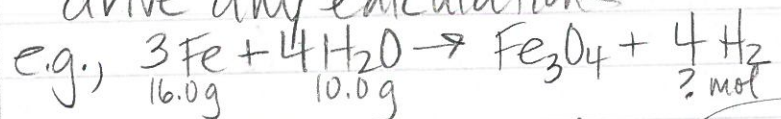
limiting reactant

a limiting reactant is the reactant present in limited supply that determines the amt. of product formed

strategy for solving limiting reactant probs

problem-solving steps

- 1) Calc. amt. of product formed from each reactant
- 2) determine limiting reactant = the reactant that gives the least amt. of product
- 3) the limiting reactant will drive any calculations



$$\text{Fe}: 16.0\text{g Fe} \times \frac{1\text{mol Fe}}{55.85\text{g Fe}} \times \frac{4\text{mol H}_2}{3\text{mol Fe}} = 0.382\text{ mol H}_2$$

$$\text{H}_2\text{O}: 10.0\text{g H}_2\text{O} \times \frac{1\text{mol H}_2\text{O}}{18.016\text{g H}_2\text{O}} \times \frac{4\text{mol H}_2}{4\text{mol H}_2\text{O}} = 0.555\text{ mol H}_2$$

theoretical yield

Theoretical yield is the max. amt. of product that can be obtained from a given amt. of reactants  
e.g., see above = 0.382 mol H<sub>2</sub>

actual yield

actual yield is the measured amt. of product obtained from a chem. rxn.

percent yield

percent yield is the actual yield of a chem rxn as a % of its theoretical yield

$$\frac{\text{actual yield}}{\text{theoretical yield}} \times 100 = \% \text{ yield}$$

e.g. see prev. page

- theoretical yield = 0.382 mol H<sub>2</sub>

actual yield = 0.258 mol H<sub>2</sub>

= % yield

$$\% \text{ yield} = \frac{0.258 \text{ mol}}{0.382 \text{ mol}} \times 100$$

= 67.5%