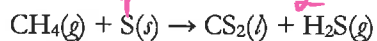


CHEM 106 Chapter 9 Stoichiometry

MOLE-MOLE

1. Balance the equation. How many moles of H_2S are expected when 2.55 moles methane react?



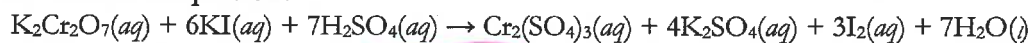
2.55 mol CH_4 ? mol H_2S

	R	P
C	1	1
H	4	2
S	1	2

$$2.55 \text{ mol CH}_4 \times \frac{2 \text{ mol H}_2\text{S}}{1 \text{ mol CH}_4} = 5.10 \text{ mol H}_2\text{S}$$

exact

2. Given the balanced equation:



- a) Calculate the number of moles of H_2SO_4 that will react with 2.0 mol KI.

$$2.0 \text{ mol KI} \times \frac{7 \text{ mol H}_2\text{SO}_4}{6 \text{ mol KI}} = 2.33333$$

exact

2.3 mol H_2SO_4

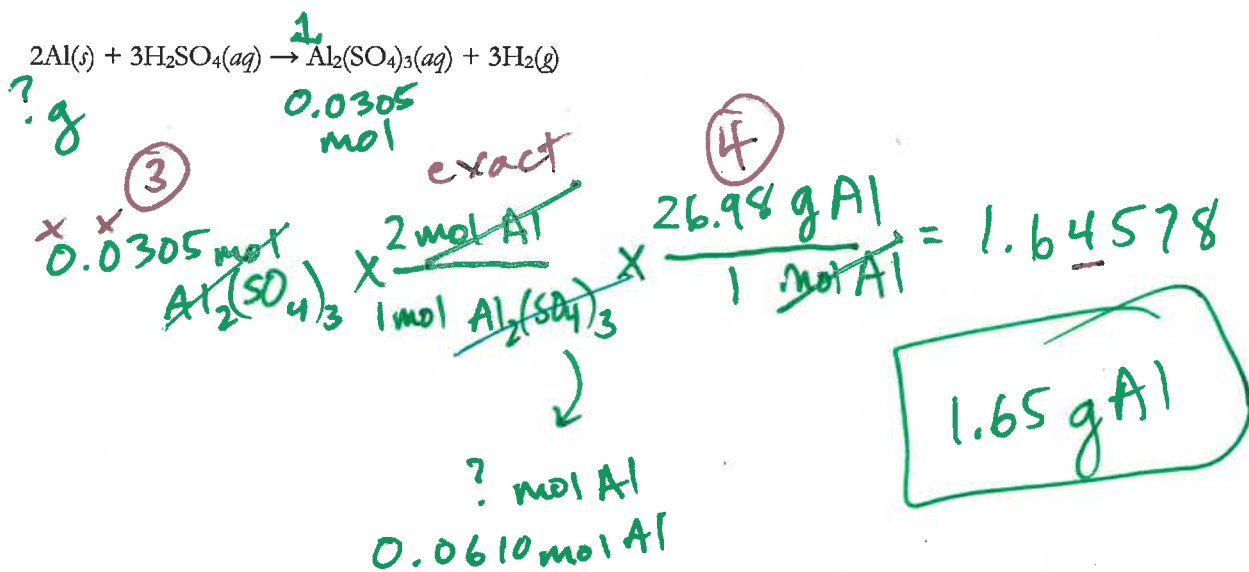
- b) Calculate the number of moles of I_2 that will be produced from 2.0 mol KI.

$$2.0 \text{ mol KI} \times \frac{3 \text{ mol I}_2}{6 \text{ mol KI}} = 1$$

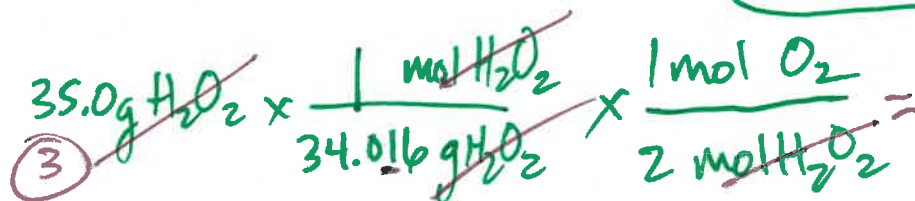
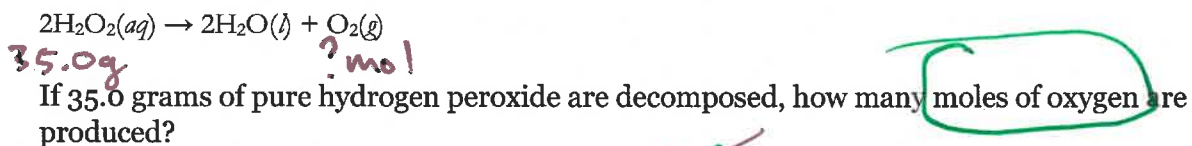
1.0 mol I_2

MOLE-GRAM

3. How many grams of aluminum metal should react to produce 0.0305 moles aluminum sulfate?



4. Oxygen gas can be produced by decomposing hydrogen peroxide:



$$= 0.51446378$$

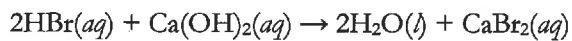
0.514 mol O₂

GRAM-GRAM

80.908 g/mol

74.096 g/mol

5. How many grams of HBr would react with 1.29 grams Ca(OH)₂ in the equation below?



? g 1.29 g

$$1.29 \text{ g Ca}(\text{OH})_2 \times \frac{1 \text{ mol Ca}(\text{OH})_2}{74.096 \text{ g Ca}(\text{OH})_2} \times \frac{2 \text{ mol HBr}}{1 \text{ mol Ca}(\text{OH})_2} \times \frac{80.908 \text{ g HBr}}{1 \text{ mol HBr}}$$

0.0174 mol Ca(OH)₂ 0.0348 mol HBr 2.81719

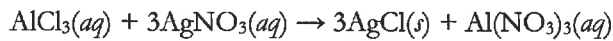
2.82 g HBr

L.R.

6. What mass silver chloride is expected (theoretical yield) when 132.0 grams AlCl_3 react with excess silver nitrate?

~~133.33 g/mol~~

143.35



132.0g excess ?g

$$\textcircled{4} \quad 132.0 \text{ g AlCl}_3 \times \frac{1 \text{ mol AlCl}_3}{133.33 \text{ g AlCl}_3} \times \frac{3 \text{ mol AgCl}}{1 \text{ mol AlCl}_3} \times \frac{143.35 \text{ g AgCl}}{1 \text{ mol AgCl}}$$

$$= \boxed{425.8 \text{ g AgCl}} \quad \text{theoretical yield}$$

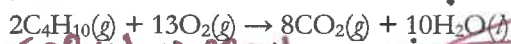
e.g. A student carries out the reaction and obtains 407.3g AgCl . what is the percent yield?

$$\% \text{ yield} = \frac{407.3 \text{ g}}{425.8 \text{ g}} \times 100\%$$

$$\boxed{\% \text{ y} = 95.66\%}$$

LIMITING REACTANT

7. You combine 5.00 moles butane with 10.00 moles oxygen. The balanced equation is below.



5.00 mol ~~10.00 mol~~
a) How many moles of water [?] are produced?

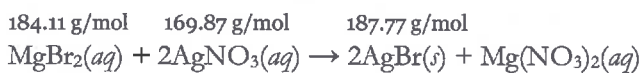
b) What is the limiting reactant?

$$5.00 \text{ mol } \cancel{\text{C}_4\text{H}_{10}} \times \frac{10 \text{ mol H}_2\text{O}}{2 \text{ mol } \cancel{\text{C}_4\text{H}_{10}}} = 25.0 \text{ mol H}_2\text{O}$$

$$10.00 \text{ mol } \text{O}_2 \times \frac{10 \text{ mol H}_2\text{O}}{13 \text{ mol } \text{O}_2} = 7.692 \text{ mol H}_2\text{O}$$

O_2 is the limiting reactant

8. How many grams silver bromide (AgBr) can be formed when solutions containing 50.0 g MgBr₂ and 100.0 g AgNO₃ are mixed? Which reactant is limiting? The molar masses are provided along with the balanced equation below.



Since two reactant amounts given, problem is L.R.

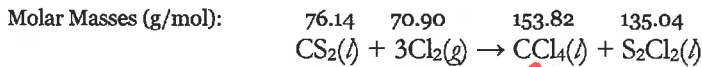
$$\frac{\text{MgBr}_2 \rightarrow \text{AgBr}}{50.0 \text{ g MgBr}_2 \times \frac{1 \text{ mol MgBr}_2}{184.11 \text{ g MgBr}_2} \times \frac{2 \text{ mol AgBr}}{1 \text{ mol MgBr}_2} \times \frac{187.77 \text{ g AgBr}}{1 \text{ mol AgBr}} = 102 \text{ g AgBr}$$

theoretical yield

$$\frac{\text{AgNO}_3 \rightarrow \text{AgBr}}{100.0 \text{ g AgNO}_3 \times \frac{1 \text{ mol AgNO}_3}{169.87 \text{ g AgNO}_3} \times \frac{2 \text{ mol AgBr}}{2 \text{ mol AgNO}_3} \times \frac{187.77 \text{ g AgBr}}{1 \text{ mol AgBr}} = 111 \text{ g AgBr}$$

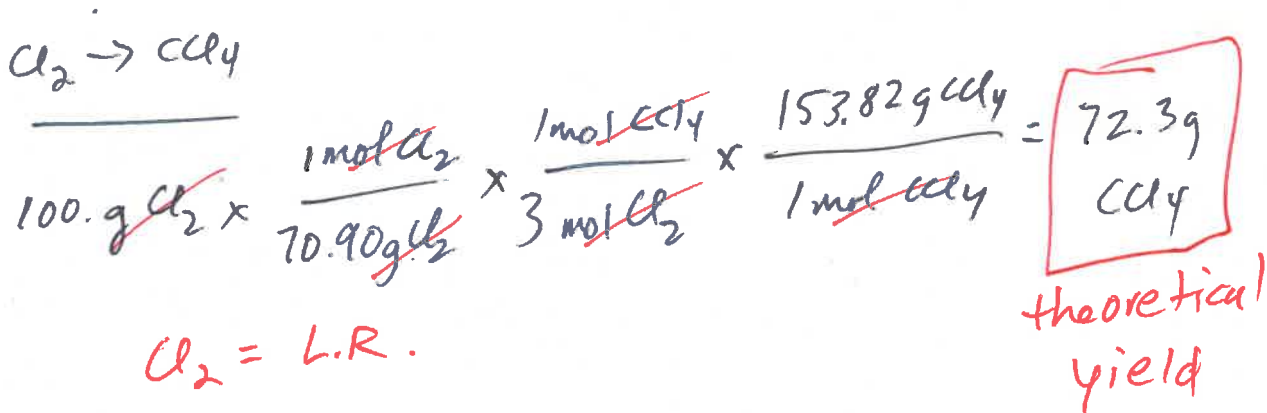
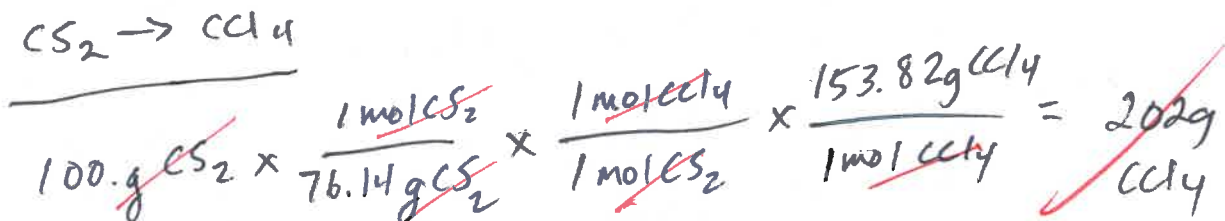
MgBr₂ is the limiting reactant, since it will only yield 102 g AgBr (the smaller of the two calculations).

9. Carbon tetrachloride was prepared by reacting 100.g carbon disulfide and 100.g chlorine gas. The equation and molar masses are below.



Calculate the percent yield if 65.0 g CCl_4 was obtained.

STEPS



$$\text{Percent Yield} = \frac{65.0\text{g actual}}{72.3\text{g theoretical}} \times 100\%$$

$$= 89.9\% \text{ yield}$$