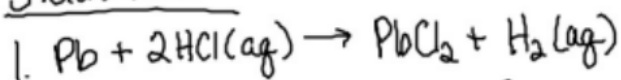


Stoich. Hmwk:

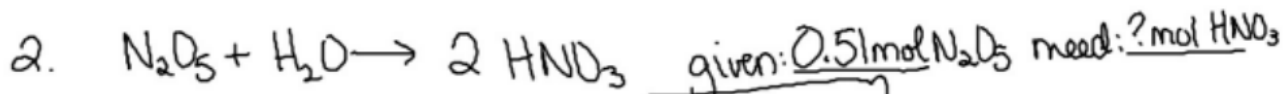


a) given: 0.36 mol Pb need: ? mol HCl Type: mol  $\rightarrow$  mol

$$0.36 \text{ mol Pb} \times \frac{2 \text{ mol HCl}}{1 \text{ mol Pb}} = \boxed{0.72 \text{ mol HCl}}$$

b) given: 4.3 mol HCl need: ? mol H<sub>2</sub> Type: mol  $\rightarrow$  mol

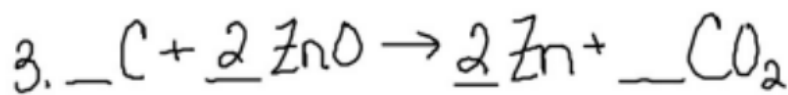
$$4.3 \text{ mol HCl} \times \frac{1 \text{ mol H}_2}{2 \text{ mol HCl}} = 2.15 \rightarrow \boxed{2.2 \text{ mol H}_2}$$



$$0.51 \text{ mol N}_2\text{O}_5 \times \frac{2 \text{ mol HNO}_3}{1 \text{ mol N}_2\text{O}_5} = \boxed{1.0 \text{ mol HNO}_3}$$

2b) given: 1.2 mol N<sub>2</sub>O<sub>5</sub> need: ? mol H<sub>2</sub>O Type: mol  $\rightarrow$  mol

$$1.2 \text{ mol N}_2\text{O}_5 \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol N}_2\text{O}_5} = \boxed{1.2 \text{ mol H}_2\text{O}}$$

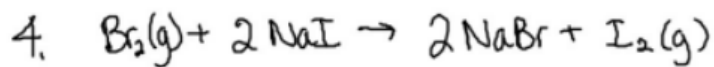


a) given: 0.38 mol ZnO need: ? mol CO<sub>2</sub> Type: mol  $\rightarrow$  mol

$$0.38 \text{ mol ZnO} \times \frac{1 \text{ mol CO}_2}{2 \text{ mol ZnO}} = \boxed{0.19 \text{ mol CO}_2}$$

b) given: 3.7 mol Zn need: ? mol ZnO Type: mol  $\rightarrow$  mol

$$3.7 \text{ mol Zn} \times \frac{2 \text{ mol ZnO}}{2 \text{ mol Zn}} = \boxed{3.7 \text{ mol ZnO}}$$



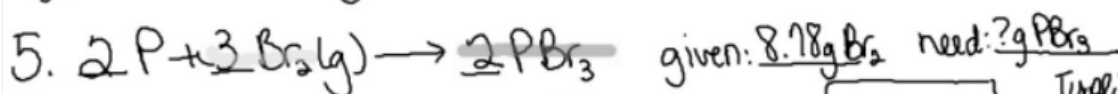
a) given: 0.69 mol Br<sub>2</sub> need: ? g NaBr Type: mole → mass

$$0.69 \text{ mol Br}_2 \times \frac{2 \text{ mol NaBr}}{1 \text{ mol Br}_2} \times \frac{102.90 \text{ g NaBr}}{1 \text{ mol NaBr}} = 142 \rightarrow \boxed{140 \text{ g NaBr}}$$

molar ratio

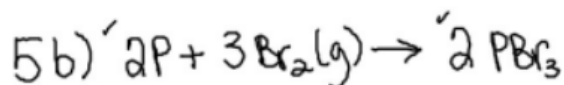
b) given: 20.0g Br<sub>2</sub> need: ? mol I<sub>2</sub> Type: mass → mol

$$20.0 \text{ g Br}_2 \times \frac{1 \text{ mol Br}_2}{159.80 \text{ g Br}_2} \times \frac{1 \text{ mol I}_2}{1 \text{ mol Br}_2} = \boxed{1.25 \times 10^{-1} \text{ or } 0.125 \text{ mol I}_2}$$



a)  $8.78 \text{ g Br}_2 \times \frac{1 \text{ mol Br}_2}{159.80 \text{ g Br}_2} \times \frac{2 \text{ mol PBr}_3}{3 \text{ mol Br}_2} \times \frac{270.67 \text{ g PBr}_3}{1 \text{ mol PBr}_3} = \boxed{9.91 \text{ g PBr}_3}$  Type: mass → mass

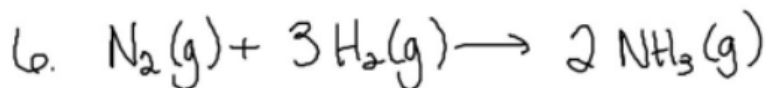
molar ratio



given: 12.87 g P need: ? g PBr<sub>3</sub> Type: mass → mass

$$12.87 \text{ g P} \times \frac{1 \text{ mol P}}{30.97 \text{ g P}} \times \frac{2 \text{ mol PBr}_3}{2 \text{ mol P}} \times \frac{270.67 \text{ g PBr}_3}{1 \text{ mol PBr}_3} = \boxed{112.5 \text{ g PBr}_3}$$

molar ratio

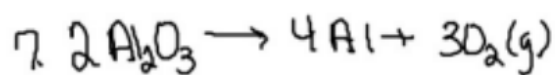


a) given: 21.48g NH<sub>3</sub> need: ? g N<sub>2</sub> mass → mass

$$21.48 \text{ g NH}_3 \times \frac{1 \text{ mol NH}_3}{17.04 \text{ g NH}_3} \times \frac{1 \text{ mol N}_2}{2 \text{ mol NH}_3} \times \frac{28.02 \text{ g N}_2}{1 \text{ mol N}_2} = \boxed{17.66 \text{ g N}_2}$$

b)  $2.24 \text{ g H}_2 \times \frac{1 \text{ mol H}_2}{2.02 \text{ g H}_2} \times \frac{1 \text{ mol N}_2}{3 \text{ mol H}_2} \times \frac{28.02 \text{ g N}_2}{1 \text{ mol N}_2} = \boxed{10.4 \text{ g N}_2}$  given: 2 mol ...  
... y N<sub>2</sub>

mass → mass



a) given: 9.8g  $\text{Al}_2\text{O}_3$  need: ? g Al mass  $\rightarrow$  mass (3 steps)

$$9.8 \text{g Al}_2\text{O}_3 \times \frac{1 \text{ mol Al}_2\text{O}_3}{101.96 \text{g Al}_2\text{O}_3} \times \frac{4 \text{ mol Al}}{2 \text{ mol Al}_2\text{O}_3} \times \frac{26.98 \text{g Al}}{1 \text{ mol Al}} = \boxed{5.2 \text{g Al}}$$

b) given: 24.97g  $\text{O}_2$  need: ? g  $\text{Al}_2\text{O}_3$  mass  $\rightarrow$  mass

$$24.97 \text{g O}_2 \times \frac{1 \text{ mol O}_2}{32.00 \text{g O}_2} \times \frac{2 \text{ mol Al}_2\text{O}_3}{3 \text{ mol O}_2} \times \frac{101.96 \text{g Al}_2\text{O}_3}{1 \text{ mol Al}_2\text{O}_3} = \boxed{53.04 \text{g Al}_2\text{O}_3}$$

When volume is used replace molar mass with 22.4 L.

Vol  $\rightarrow$  vol mol  $\rightarrow$  vol molar ratios last step

$$\text{amt given: } \frac{1 \text{ mol given}}{22.4 \text{ L given}} \times \frac{\# \text{ mol needed}}{\# \text{ mol given}} \times \frac{22.4 \text{ L needed}}{1 \text{ mol needed}} =$$

mol  $\rightarrow$  vol (2 conv.)

Vol  $\rightarrow$  mol (2 conv.)

mass  $\rightarrow$  vol

$$\text{amt given} \times \frac{1 \text{ mol given}}{\text{molar mass given}} \times \frac{\# \text{ mol needed}}{\# \text{ mol given}} \times \frac{22.4 \text{ L needed}}{1 \text{ mol needed}} =$$

vol  $\rightarrow$  mass

$$\text{amt given} \times \frac{1 \text{ mol given}}{\text{molar mass given}} \times \frac{\# \text{ mol needed}}{\# \text{ mol given}} \times \frac{\text{molar mass needed}}{1 \text{ mol needed}} =$$

8a) given:  $0.72 \text{ mol F}_2$  need:  $? \text{ L I}_2$  type:  $\text{mol} \rightarrow \text{L}$  (2 steps)

$$0.72 \text{ mol F}_2 \times \frac{1 \text{ mol I}_2}{1 \text{ mol F}_2} \times \frac{22.4 \text{ L I}_2}{1 \text{ mol I}_2} = \boxed{16 \text{ L I}_2}$$

use coefficients

9a) given:  $15.0 \text{ L H}_2$  need:  $? \text{ mol Na}$  type:  $\text{L} \rightarrow \text{mol}$  (2 steps)

$$15.0 \text{ L H}_2 \times \frac{1 \text{ mol H}_2}{22.4 \text{ L H}_2} \times \frac{2 \text{ mol Na}}{1 \text{ mol H}_2} = \boxed{1.34 \text{ mol Na}}$$

$(15.0 \times 2) \div 22.4 = 15.0 \times \frac{2}{22.4}$

10a) given:  $31.8 \text{ L NH}_3$  need:  $? \text{ L N}_2$  type:  $\text{L} \rightarrow \text{L}$  (3 steps)

$$31.8 \text{ L NH}_3 \times \frac{1 \text{ mol NH}_3}{22.4 \text{ L NH}_3} \times \frac{1 \text{ mol N}_2}{2 \text{ mol NH}_3} \times \frac{22.4 \text{ L N}_2}{1 \text{ mol N}_2} = \boxed{15.9 \text{ L N}_2}$$

$(31.8 \times 22.4) \div (22.4 \times 2) =$

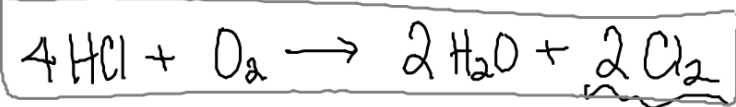
### Limiting Factor:

① Complete 2 problems reactant 1  $\rightarrow$  product  
reactant 2  $\rightarrow$  product

② Compare the quantities for the products — the smaller # is the theoretical yield.

③ The reactant that had the smaller yield is the Limiting factor (LF).

④  $\% \text{ yield} = \frac{\text{actual yield (from experiment)}}{\text{theoretical yield}} \times 100$



$$750 \text{g HCl} \rightarrow ? \text{g Cl}_2$$

$$\underset{\substack{\text{Limiting Factor} \\ \uparrow}}{750 \text{g HCl}} \times \frac{1 \text{ mol HCl}}{36.46 \text{g HCl}} \times \underbrace{\frac{2 \text{ mol Cl}_2}{4 \text{ mol HCl}}}_{\text{coefficients}} \times \frac{70.90 \text{ g Cl}_2}{1 \text{ mol Cl}_2}$$

$$320 \text{g O}_2 \rightarrow ? \text{g Cl}_2$$

$$320 \text{g O}_2 \times \frac{1 \text{ mol O}_2}{32.00 \text{g O}_2} \times \underbrace{\frac{2 \text{ mol Cl}_2}{1 \text{ mol O}_2}}_{\text{molar ratio}} \times \frac{70.90 \text{ g Cl}_2}{1 \text{ mol Cl}_2} = 1418 \text{ g Cl}_2$$

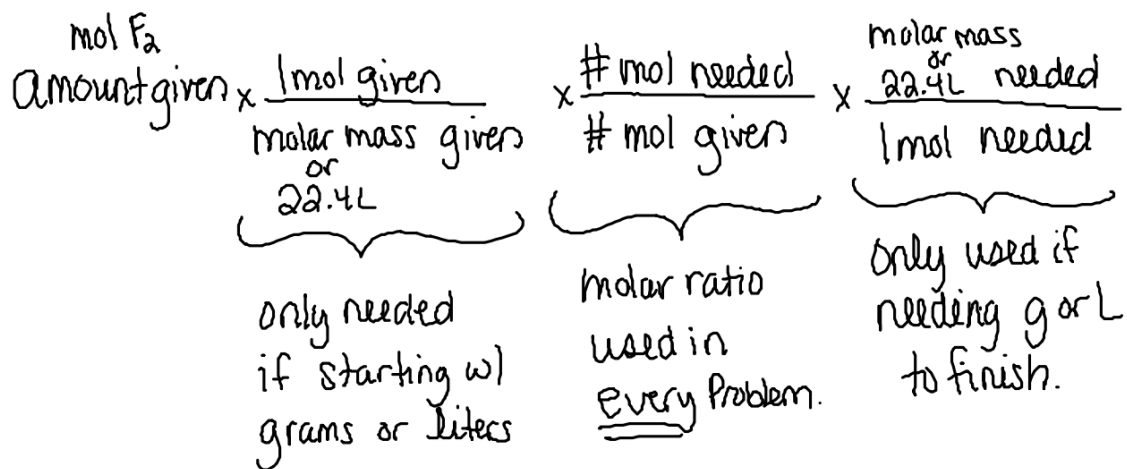
Theoretical yield  

730
729.22 g Cl <sub>2</sub>

 Ty.

If the experiment produced 698 g Cl<sub>2</sub> what is the % yield?

$$\frac{698 \text{ g}}{730 \text{ g}} \times 100 = 96 \% \text{ yield}$$



given: 0.72 mol F<sub>2</sub> needed: ? L I<sub>2</sub> type: mol → L

$$8a) 0.72 \text{ mol F}_2 \times \frac{1 \text{ mol I}_2}{1 \text{ mol F}_2} \times \frac{22.4 \text{ L I}_2}{1 \text{ mol I}_2} = \boxed{16 \text{ L I}_2}$$