Follow along as you view the video, "Stoichiometry Calculations II: Mass-Mass Conversions" on edpzzle.com and fill in the blanks as you go. (Also available at (http://youtu.be/hKThjKFEbtM)

- Stoichiometry & Mass
  - Problems that begin or end in mass are more realistic
    - We can measure mass directly
  - We will use molar mass to convert to or from moles
  - The Mole-Mole conversions using the coefficients from the balanced chemical equation remain central to the calculations
- Starting with mass
  - The process looks familiar (*dimensional analysis!*)
    - First identify given quantity (G) and wanted quantity (W)
    - Select mole ratios with coefficients of W/G from balanced equation
    - Next set up the calculation:
      - First multiply the mass of G by $\frac{1 \text{ mol G}}{\text{Molar Mass G}}$
      - Continue by multiplying by $\frac{\text{b mol W}}{\text{a mol G}}$ as before (b & a are coefficients of W & G in balanced equation)
    - For the reaction $N_2(g) + 3\ H_2(g) \rightarrow 2\ NH_3(g)$, determine the number of moles of NH_3 produced by reacting 16.2 grams of H_2 with sufficient N_2.

$$? \text{ mol } NH_3 = 16.2 \text{ g } H_2 \times \frac{1 \text{ mol } H_2}{2.02 \text{ g } H_2} \times \frac{2 \text{ mol } NH_3}{3 \text{ mol } H_2} = \boxed{5.35 \text{ mol } NH_3}$$

- Ending with mass
  - First identify given quantity (G) and wanted quantity (W)
  - Select mole ratios with coefficients of W / G from balanced equation
  - Again set up the calculations
    - First, multiply moles G by $\frac{\text{b mol W}}{\text{a mol G}}$ as before
    - Next multiply by $\frac{\text{Molar Mass W}}{1 \text{ mol W}}$ to calculate mass W
  - For the reaction $N_2(g) + 3\ H_2(g) \rightarrow 2\ NH_3(g)$, determine the mass of N_2 required to fully react with 23.8 mol H_2.

$$? \text{ g } N_2 = 23.8 \text{ mol } H_2 \times \frac{1 \text{ mol } N_2}{3 \text{ mol } H_2} \times \frac{28.02 \text{ g } N_2}{1 \text{ mol } N_2} = \boxed{222 \text{ g } N_2}$$

- Starting & Ending in Mass
  - If both G and W are in mass, you must convert g G to moles G, then convert moles W to g W at the end: mass G → moles G → moles W → mass W
  - For the reaction $4\ P(s) + 5\ O_2(g) \quad P_4O_{10}(s)$, determine the number of grams of O_2 required to completely react with 39.2 grams of P.
    - Use Dimensional Analysis to guide you:
    - Multiply mass G by $\frac{1 \text{ mol G}}{\text{Molar Mass G}}$ to get mol G
    - Multiply by $\frac{\text{b mol W}}{\text{a mol G}}$ to get to mol W

- Multiply by $\frac{\text{Molar Mass W}}{\text{1 mol W}}$ to get mass W:

$$?\text{ g } O_2 = 39.2\text{ g P} \times \frac{1\text{ mol P}}{30.97\text{ g P}} \times \frac{5\text{ mol } O_2}{4\text{ mol P}} \times \frac{32.00\text{ g } O_2}{1\text{ mol } O_2} = \boxed{50.6\text{ g } O_2}$$

  - Remember: if given mol G, don't convert to mass—start at 2nd step

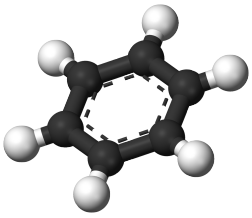
- Your Turn
  - Given the reaction for the combustion of benzene (C_6H_6),

$$2\ C_6H_6(\ell) + 15\ O_2(g) \rightarrow 12\ CO_2(g) + 6\ H_2O(g)$$

how many g O_2 are needed to fully react with 84.7 g benzene?

$$\text{mass } O_2 = \frac{84.7\text{ g } C_6H_6}{} \left| \frac{1\text{ mol } C_6H_6}{78.17\text{ g } C_6H_6} \right| \frac{15\text{ mol } O_2}{2\text{ mol } C_6H_6} \left| \frac{32.00\text{ g } O_2}{1\text{ mol } O_2} \right.$$

$$= \boxed{260.\text{ g } O_2}$$



Benzene, C_6H_6

- Reading: Read Section 12.2 pg. 360-363 in textbook