LIMITING REACTANT & % YIELD PRACTICE WORKSHEET

1. Methanol, CH_3OH, can be produced by the following reaction:
   $2H_2 + CO \rightarrow CH_3OH$

   a) Calculate the theoretical yield of CH_3OH if 68.5 g of CO is reacted with 8.6 g of H_2.

$$68.5\ g\ CO\left(\frac{1\,mol\,CO}{28\,g\,CO}\right)\left(\frac{1\,mol\,CH_3OH}{1\,mol\,CO}\right)\left(\frac{32\,g\,CH_3OH}{1\,mol\,CH_3OH}\right) = 78.3\ g\ CH_3OH$$

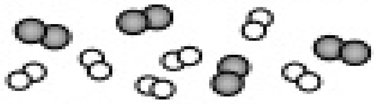
$$8.6\ g\ H_2\left(\frac{1\,mol\,H_2}{2.0\,g\,H_2}\right)\left(\frac{1\,mol\,CH_3OH}{2\,mol\,H_2}\right)\left(\frac{32\,g\,CH_3OH}{1\,mol\,CH_3OH}\right) = 68.8\ g\ CH_3OH$$

Theoretical yield = 68.8 g CH_3OH
H_2 is LR, CO is in excess

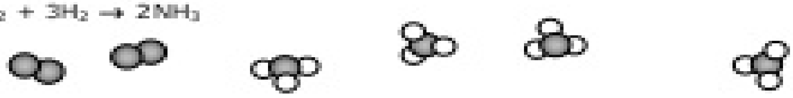
   b) If 35.7 g CH_3OH is actually produced, what is the % yield of methanol?

$$\%\ Yield = \frac{Actual\ Yield}{Theoretical\ Yield} \times 100\% = \frac{35.7}{68.8} \times 100\% = 51.9\%$$

2. Nitrogen and hydrogen react to form ammonia (NH_3). Consider the mixture of N_2 (gray spheres) and H_2 (white spheres) in the picture below. Draw a picture of the product mixture, assuming that the reaction goes to completion. Which is the limiting reactant?



$N_2 + 3H_2 \rightarrow 2NH_3$



H_2 is LR; N_2 is in excess

3. Part of the SO_2 that is introduced into the atmosphere by combustion of sulfur containing compounds ends up being converted to sulfuric acid, H_2SO_4. How many moles of H_2SO_4 can be formed from 5.0 mol SO_2, 4.0 mol O_2 and 10.0 mol H_2O? Which is the limiting reactant?

$$2SO_2(g) + O_2(g) + 2H_2O(l) \rightarrow 2H_2SO_4(aq)$$