Stoichiometry
Worksheet #3

1. Ethyl alcohol, C_2H_5OH, burns with a pale blue flame. The products of this combustion are CO_2 and water vapour as indicated by the balanced equation below

   $$C_2H_5OH\ (l) + 3\ O_2\ (g) \rightarrow 2\ CO_2\ (g) + 3\ H_2O\ (g)$$

   A combustion reaction produced 65.0 g H_2O (g). What mass of ethyl alcohol was used? answer: 55.37 g

2. Methanol, CH_3OH, can be manufactured by combination of gaseous hydrogen and carbon monoxide, as indicated by the equation below

   $$2\ H_2\ (g) + CO\ (g) \rightarrow CH_3OH\ (l)$$

   What mass of CO (g) is required to react with 85.0 g H_2 (g)? answer: 589 g

3. Sodium bicarbonate, $NaHCO_3$, also known as baking soda, decomposes according to the balanced equation below

   $$2\ NaHCO_3\ (s) \rightarrow CO_2\ (g) + H_2O\ (g) + Na_2CO_3\ (s)$$

   A technician decomposes 6.50 g $NaHCO_3$ at a high temperature and obtains 3.88 g Na_2CO_3. Calculate the percent yield for his activity. Answer: 95%

4. Nitrogen gas, N_2, can be prepared by the following reaction

   $$2\ NH_3 + 3\ CuO \rightarrow N_2 + 3\ Cu + 3\ H_2O$$

   a) Suppose 20.0 g NH_3 reacts. How many Cu atoms will be produced?
   Answer: 1.06×10^{24} Cu atoms
   b) Suppose 20.0 g NH_3 reacts. How many N_2 molecules will be produced?
   Answer: 3.53×10^{23} N_2 molecules

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5. If the percent yield of the reaction below is 98.5%, then what mass of N_2H_4 is needed to produce 49.0 grams of NO_2? Answer: 17.3 g

   $$N_2H_4\ (g) + 3\ O_2\ (g) \rightarrow 2\ NO_2\ (g) + 2\ H_2O\ (g)$$