STOICHIOMETRY PROBLEMS 1 (KEY)

Directions: **Use your mole map to help you answer the following questions. SHOW ALL WORK USING DIMENSIONAL ANALYSIS!! Label all numbers with both units and the formula of the compound.**

Propane, C_3H_8, burns in oxygen to produce carbon dioxide and water.

a. Write a balanced equation for the reaction described above:

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

1 mole C_3H_8 : 5 moles O_2 : 3 moles CO_2 : 4 moles H_2O

b. How many moles of water can be produced from 2.5 moles of propane? Assume there is an **EXCESS** of oxygen.

$$\frac{2.5 \text{ moles } C_3H_8}{1} \left| \frac{4 \text{ moles } H_2O}{1 \text{ mole } C_3H_8} \right. = 10. \text{ moles } H_2O$$

(bal. eq.)

c. How many grams of carbon dioxide can be formed from 3.00 moles of oxygen reacting with an excess of propane?

$$\frac{3.00 \text{ moles } O_2}{1} \left| \frac{3 \text{ moles } CO_2}{5 \text{ moles } O_2} \right| \frac{44.01 \text{ g } CO_2}{1 \text{ mole } CO_2} = 79.2 \text{ g } CO_2$$

(bal. eq.)

d. If 25.0 g of propane is reacted with an excess of oxygen, how many grams of carbon dioxide will be produced?

$$\frac{25.0 \text{ g } C_3H_8}{1} \left| \frac{1 \text{ mole } C_3H_8}{44.11 \text{ g } C_3H_8} \right| \frac{3 \text{ moles } CO_2}{1 \text{ mole } C_3H_8} \left| \frac{44.01 \text{ g } CO_2}{1 \text{ mole } CO_2} \right. = 74.8 \text{ g } CO_2$$

(bal. eq.)

e. How many grams of propane are necessary to produce 5.00 kg of water?

$$\frac{5.00 \text{ kg } H_2O}{1} \left| \frac{1000 \text{ g } H_2O}{1 \text{ kg } H_2O} \right| \frac{1 \text{ mole } H_2O}{18.02 \text{ g } H_2O} \left| \frac{1 \text{ mole } C_3H_8}{4 \text{ moles } H_2O} \right| \frac{44.11 \text{ g } C_3H_8}{1 \text{ mole } C_3H_8} = 3060 \text{ g } C_3H_8$$

f. How many water molecules will be produced from the reaction of 36.5 g of oxygen with an excess amount of propane?

$$\frac{36.5 \text{ g } O_2}{1} \left| \frac{1 \text{ mole } O_2}{32.00 \text{ g } O_2} \right| \frac{4 \text{ moles } H_2O}{5 \text{ moles } O_2} \left| \frac{6.02 \times 10^{23} \text{ molecules } H_2O}{1 \text{ mole } H_2O} \right. = 5.49 \times 10^{23} \text{ molecules } H_2O$$

g. How many molecules of oxygen are needed to make 4.03×10^{30} molecules of water?

$$\frac{4.03 \times 10^{30} \text{ molecules } H_2O}{1} \left| \frac{1 \text{ mole } H_2O}{6.02 \times 10^{23} \text{ molecules } H_2O} \right| \frac{5 \text{ moles } O_2}{4 \text{ moles } H_2O} \left| \frac{6.02 \times 10^{23} \text{ molecules } O_2}{1 \text{ mole } O_2} \right. = 5.04 \times 10^{30} \text{ molecules } O_2$$

h. How many grams of ~~carbon dioxide~~ propane would be needed to react exactly with 50.0 g of oxygen?

$$\frac{50.0 \text{ g } O_2}{1} \left| \frac{1 \text{ mole } O_2}{32.00 \text{ g } O_2} \right| \frac{1 \text{ mole } C_3H_8}{5 \text{ moles } O_2} \left| \frac{44.11 \text{ g } C_3H_8}{1 \text{ mole } C_3H_8} \right. = 13.8 \text{ g } C_3H_8$$