

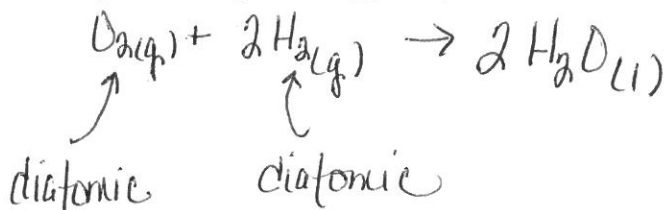
Honors Chemistry Study Guide

Stoichiometry

Show all work using dimensional analysis. Round answer to sig. figs. of given. No Stoich. Map.

1. Oxygen reacts with hydrogen to produce..... *Synthesis Reaction*

a) Predict product(s) and balance.



b) How many moles of oxygen is needed to react with 5.00 moles of hydrogen?

$$5.00 \text{ moles H}_2 \left(\frac{1 \text{ mol O}_2}{2 \text{ moles H}_2} \right) = 2.50 \text{ moles of O}_2$$

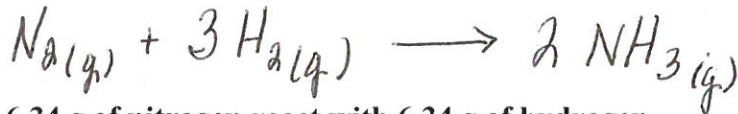
c) How many grams of water are produced from 3.50 moles hydrogen and excess oxygen?

$$3.50 \text{ moles H}_2 \left(\frac{2 \text{ moles H}_2\text{O}}{2 \text{ moles H}_2} \right) \left(\frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} \right) = 63.1 \text{ g of H}_2\text{O}$$

d) How many grams of oxygen are needed to react with excess hydrogen to produce 9.00 g of water?

$$9.00 \text{ g H}_2\text{O} \left(\frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \right) \left(\frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}} \right) \left(\frac{32.00 \text{ g O}_2}{1 \text{ mol O}_2} \right) = 8.00 \text{ g of O}_2$$

2. Nitrogen reacts with hydrogen to produce *Synthesis Reaction*
 a) Predict product(s) and balance.



- b) 6.34 g of nitrogen react with 6.34 g of hydrogen.

1. What is the limiting reactant?

$$6.34 \text{ g N}_2 \left(\frac{1 \text{ mol N}_2}{28.02 \text{ g N}_2} \right) = 0.226 \text{ mol N}_2 = 0.226 \text{ mol N}_2 \leftarrow \text{limiting reactant (it has the smaller \# (amt))}$$

\leftarrow coefficient

$$6.34 \text{ g H}_2 \left(\frac{1 \text{ mol H}_2}{2.02 \text{ g H}_2} \right) = 3.14 \text{ mol H}_2 = 1.05 \text{ mol H}_2$$

\leftarrow coefficient

2. How much product (in grams) is formed?

$$0.226 \text{ mol N}_2 \left(\frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \right) \left(\frac{17.04 \text{ g NH}_3}{1 \text{ mol NH}_3} \right) = 7.70 \text{ g NH}_3$$

Use your limiting reactant. Can only make enough product to use up the limiting reagent.

3. How much of the excess reactant was used?

$$0.226 \text{ mol N}_2 \left(\frac{3 \text{ mol H}_2}{1 \text{ mol N}_2} \right) \left(\frac{2.02 \text{ g H}_2}{1 \text{ mol H}_2} \right) = 1.37 \text{ g H}_2$$

4. How much of the excess reactant is left over?

Started w/ used up reacting w/ N₂

$$6.34 \text{ g H}_2 - 1.37 \text{ g H}_2 = 4.97 \text{ g of H}_2 \text{ left over}$$

5. If 7.00 g of product was formed in lab, then what is your % yield?

$$\% \text{ yield} = \frac{7.00 \text{ g} \leftarrow \text{Actual}}{7.70 \text{ g} \leftarrow \text{Theoretical}} \times 100 = 91.9 \%$$