

## Equation Stoichiometry Chemistry 110

1] Given the equation:  $2\text{C}_8\text{H}_{18} + 25\text{O}_2 \rightarrow 16\text{CO}_2 + 18\text{H}_2\text{O}$

a. How many moles of oxygen gas are required to make 8.33 moles of carbon dioxide?

$$8.33 \text{ moles CO}_2 \times \frac{25 \text{ mol O}_2}{16 \text{ mol CO}_2} = 13.0 \text{ moles O}_2$$

Answer \_\_\_\_\_

b. How many moles of  $\text{C}_8\text{H}_{18}$  must be used to produce 1.99 grams of water

$$1.99 \text{ mg H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g}} \times \frac{2 \text{ mol C}_8\text{H}_{18}}{18 \text{ mol H}_2\text{O}} = 1.23 \times 10^{-2} \text{ mol C}_8\text{H}_{18}$$

Answer \_\_\_\_\_

c. If the reaction produces 5.3 mg of carbon dioxide how many grams of water are produced?

$$5.3 \text{ mg CO}_2 \times \frac{10^{-3} \text{ g}}{1 \text{ mg}} \times \frac{1 \text{ mol CO}_2}{44.0 \text{ g CO}_2} \times \frac{18 \text{ mol H}_2\text{O}}{16 \text{ mol CO}_2} \times \frac{18.0 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} =$$

$$2.4 \times 10^{-3} \text{ g H}_2\text{O}$$

Answer \_\_\_\_\_

d. How many grams of oxygen are needed to react with  $7.22 \times 10^{24}$  molecules of  $\text{C}_8\text{H}_{18}$ ?

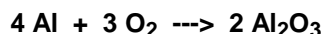
$$7.22 \times 10^{24} \text{ molec. C}_8\text{H}_{18} \times \frac{1 \text{ mol C}_8\text{H}_{18}}{6.02 \times 10^{23} \text{ molec}} \times \frac{25 \text{ mol O}_2}{2 \text{ mol C}_8\text{H}_{18}} \times \frac{32.0 \text{ g O}_2}{1 \text{ mol O}_2} =$$

$$4.80 \times 10^3 \text{ g O}_2$$

Answer \_\_\_\_\_

2] How many grams of aluminum oxide are formed when 25.0 grams of Aluminum are reacted with oxygen gas?

a. Write the balanced equation



b. Calculate the number of grams of aluminum oxide produced

$$25.0 \text{ g Al} \times \frac{1 \text{ mol Al}}{27.0 \text{ g Al}} \times \frac{1 \text{ mol Al}_2\text{O}_3}{2 \text{ mol Al}} \times \frac{102.0 \text{ g Al}_2\text{O}_3}{1 \text{ mol Al}_2\text{O}_3} = 47.2 \text{ g Al}_2\text{O}_3$$

Answer \_\_\_\_\_

3] A sample of  $\text{TiCl}_4$  is reacted with Titanium metal to produce Titanium (III) chloride

a. Write the balanced equation



b. How many kg of Titanium (III) chloride was produced from 52 kg of Titanium (IV) chloride?

$$52 \text{ Kg TiCl}_4 \times \frac{10^3 \text{ g}}{1 \text{ Kg}} \times \frac{1 \text{ mol TiCl}_4}{189.9 \text{ g TiCl}_4} \times \frac{4 \text{ mol TiCl}_3}{3 \text{ mol TiCl}_4} \times \frac{154.4 \text{ g TiCl}_3}{1 \text{ mol TiCl}_3} \times \frac{10^{-3} \text{ Kg}}{1 \text{ g}} =$$

$$56.4 \text{ Kg TiCl}_3$$

Answer \_\_\_\_\_

4] Given the equation:  $\text{Al}_4\text{C}_3 + 12 \text{H}_2\text{O} \rightarrow 4\text{Al}(\text{OH})_3 + 3 \text{CH}_4$

a. How many grams of water are needed to react with 100.0 moles of  $\text{Al}_4\text{C}_3$ ?

$$100.0 \text{ mol Al}_4\text{C}_3 \times \frac{12 \text{ mol H}_2\text{O}}{1 \text{ mol Al}_4\text{C}_3} \times \frac{18.01 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 2.160 \times 10^4 \text{ g H}_2\text{O}$$

Answer \_\_\_\_\_

b. How many moles of  $\text{Al}_4\text{C}_3$  were reacted when  $3.55 \times 10^{35}$  formula units of aluminum hydroxide were produced?

$$3.55 \times 10^{35} \text{ formula units Al}(\text{OH})_3 \times \frac{1 \text{ mol Al}(\text{OH})_3}{6.02 \times 10^{23} \text{ form. units}} \times \frac{1 \text{ mol Al}_4\text{C}_3}{4 \text{ mol Al}(\text{OH})_3} =$$

$$1.47 \times 10^{11} \text{ mol Al}(\text{OH})_3$$

Answer \_\_\_\_\_

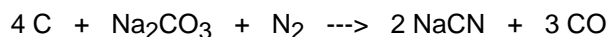
c. How many grams of aluminum hydroxide were produced when 673 mg of  $\text{CH}_4$  were formed.?

$$673 \text{ mg CH}_4 \times \frac{10^{-3} \text{ g}}{1 \text{ mg}} \times \frac{1 \text{ mol CH}_4}{16.0 \text{ g CH}_4} \times \frac{4 \text{ mol Al}(\text{OH})_3}{3 \text{ mol CH}_4} \times \frac{78.0 \text{ g Al}(\text{OH})_3}{1 \text{ mol Al}(\text{OH})_3} =$$

$$4.37 \text{ g Al}(\text{OH})_3$$

Answer \_\_\_\_\_

5] Given the reaction:



181 grams of sodium carbonate were added to an excess of carbon and nitrogen. After the reaction finished, 35 g of **unreacted sodium carbonate remained**.

a. How many moles of carbon monoxide were produced?

$$181 \text{ g total Na}_2\text{CO}_3 - 35 \text{ g unreacted Na}_2\text{CO}_3 = 146 \text{ g Na}_2\text{CO}_3 \text{ reacted}$$

$$146 \text{ g Na}_2\text{CO}_3 \times \frac{1 \text{ mol Na}_2\text{CO}_3}{106.0 \text{ g Na}_2\text{CO}_3} \times \frac{3 \text{ mol CO}}{1 \text{ mol Na}_2\text{CO}_3} = 4.13 \text{ mol CO}$$

Answer \_\_\_\_\_

b. How many grams of nitrogen gas reacted with the sodium carbonate?

$$146 \text{ g Na}_2\text{CO}_3 \times \frac{1 \text{ mol Na}_2\text{CO}_3}{106.0 \text{ g}} \times \frac{1 \text{ mol N}_2}{1 \text{ mol Na}_2\text{CO}_3} \times \frac{28.0 \text{ g N}_2}{1 \text{ mol N}_2} = 38.6 \text{ g N}_2$$

Answer \_\_\_\_\_