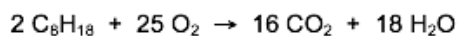


Name: KEYDate: 1/5/09

Chemistry
Stoichiometry WS 2

I. Complete the following stoichiometric calculations, balancing equations where necessary.

1. Consider the combustion of octane (C_8H_{18}):



a. How many grams of CO_2 are produced when 191.6 g of octane are burned?

$$\frac{191.6 \cancel{g C_8H_{18}}}{114.229 \cancel{g C_8H_{18}}} \times \frac{1 \cancel{mol C_8H_{18}}}{2 \cancel{mol C_8H_{18}}} \times \frac{16 \cancel{mol CO_2}}{1 \cancel{mol CO_2}} \times 44.009 \cancel{g CO_2} = 590.6 \text{ g } CO_2$$

(Handwritten notes: "wanted" above CO_2 , "given" above 191.6 g)

b. How many grams of oxygen gas are required to burn 47.03 g of octane?

$$\frac{47.03 \cancel{g C_8H_{18}}}{114.229 \cancel{g C_8H_{18}}} \times \frac{1 \cancel{mol C_8H_{18}}}{2 \cancel{mol C_8H_{18}}} \times \frac{25 \cancel{mol O_2}}{1 \cancel{mol O_2}} \times 31.998 \cancel{g O_2} = 164.7 \text{ g } O_2$$

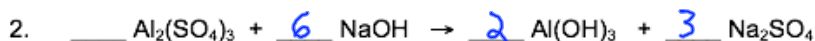
c. How many grams of H_2O are produced when 91.2 g oxygen gas are consumed?

$$\frac{91.2 \cancel{g O_2}}{31.998 \cancel{g O_2}} \times \frac{1 \cancel{mol O_2}}{25 \cancel{mol O_2}} \times \frac{18 \cancel{mol H_2O}}{1 \cancel{mol H_2O}} \times 18.015 \cancel{g H_2O} = 37.0 \text{ g } H_2O$$

d. How many liters of CO_2 are produced at STP when the reaction yields 5.05 g H_2O ?

$$\frac{5.05 \cancel{g H_2O}}{18.015 \cancel{g H_2O}} \times \frac{1 \cancel{mol H_2O}}{18 \cancel{mol H_2O}} \times \frac{16 \cancel{mol CO_2}}{1 \cancel{mol CO_2}} \times 22.4 \cancel{L CO_2} = 5.58 \text{ L } CO_2$$

(Handwritten note: "1 mol = 22.4 L" above CO_2)

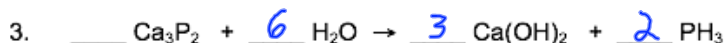


a. How many grams of NaOH are needed to completely react with 2.33 g $\text{Al}_2(\text{SO}_4)_3$?

$$\frac{2.33 \text{ g } \cancel{\text{Al}_2(\text{SO}_4)_3} \left| \frac{1 \text{ mol } \cancel{\text{Al}_2(\text{SO}_4)_3}}{342.151 \text{ g } \cancel{\text{Al}_2(\text{SO}_4)_3}} \right| \frac{6 \text{ mol } \cancel{\text{NaOH}}}{1 \text{ mol } \cancel{\text{Al}_2(\text{SO}_4)_3}} \left| \frac{39.997 \text{ g } \cancel{\text{NaOH}}}{1 \text{ mol } \cancel{\text{NaOH}}} \right|}{1} = 1.63 \text{ g NaOH}$$

b. If 87.3 g of $\text{Al}(\text{OH})_3$ are formed, how many grams of Na_2SO_4 will be produced?

$$\frac{87.3 \text{ g } \cancel{\text{Al}(\text{OH})_3} \left| \frac{1 \text{ mol } \cancel{\text{Al}(\text{OH})_3}}{78.004 \text{ g } \cancel{\text{Al}(\text{OH})_3}} \right| \frac{3 \text{ mol } \cancel{\text{Na}_2\text{SO}_4}}{2 \text{ mol } \cancel{\text{Al}(\text{OH})_3}} \left| \frac{142.042 \text{ g } \cancel{\text{Na}_2\text{SO}_4}}{1 \text{ mol } \cancel{\text{Na}_2\text{SO}_4}} \right|}{1} = 238.456 \text{ g Na}_2\text{SO}_4$$



a. How many grams of water are needed to react with 33.9 g of Ca_3P_2 ?

$$\frac{33.9 \text{ g } \cancel{\text{Ca}_3\text{P}_2} \left| \frac{1 \text{ mol } \cancel{\text{Ca}_3\text{P}_2}}{182.182 \text{ g } \cancel{\text{Ca}_3\text{P}_2}} \right| \frac{6 \text{ mol } \cancel{\text{H}_2\text{O}}}{1 \text{ mol } \cancel{\text{Ca}_3\text{P}_2}} \left| \frac{18.015 \text{ g } \cancel{\text{H}_2\text{O}}}{1 \text{ mol } \cancel{\text{H}_2\text{O}}} \right|}{1} = 20.1 \text{ g H}_2\text{O}$$

b. How many grams of PH_3 are produced when the above reaction ^{same given} takes place?

$$\frac{33.9 \text{ g } \cancel{\text{Ca}_3\text{P}_2} \left| \frac{1 \text{ mol } \cancel{\text{Ca}_3\text{P}_2}}{182.182 \text{ g } \cancel{\text{Ca}_3\text{P}_2}} \right| \frac{2 \text{ mol } \cancel{\text{PH}_3}}{1 \text{ mol } \cancel{\text{Ca}_3\text{P}_2}} \left| \frac{33.998 \text{ g } \cancel{\text{PH}_3}}{1 \text{ mol } \cancel{\text{PH}_3}} \right|}{1} = 12.7 \text{ g PH}_3$$

c. How many grams of H_2O will be needed to produce 715 g $\text{Ca}(\text{OH})_2$?

$$\frac{715 \text{ g } \cancel{\text{Ca}(\text{OH})_2} \left| \frac{1 \text{ mol } \cancel{\text{Ca}(\text{OH})_2}}{74.093 \text{ g } \cancel{\text{Ca}(\text{OH})_2}} \right| \frac{6 \text{ mol } \cancel{\text{H}_2\text{O}}}{3 \text{ mol } \cancel{\text{Ca}(\text{OH})_2}} \left| \frac{18.015 \text{ g } \cancel{\text{H}_2\text{O}}}{1 \text{ mol } \cancel{\text{H}_2\text{O}}} \right|}{1} = 348 \text{ g H}_2\text{O}$$