Equation Stoichiometry
Chemistry 110

1] Given the equation: $2C_8H_{18} + 25\ O_2 \text{ ----> } 16CO_2 + 18H_2O$

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

$$\mathbf{8.33\ moles\ CO_2\ X\ \frac{25mol\ O_2}{16mol\ CO_2} = 13.0\ moles\ O_2}$$

Answer _____

b. How many moles of C_8H_{18} must be used to produce 1.99 grams of water

$$\mathbf{1.99\ mg\ H_2O\ X\ \frac{1mol\ H_2O}{18.0g}\ X\ \frac{2mol\ C_8H_{18}}{18mol\ H_2O} = 1.23 \times 10^{-2}\ mol\ C_8H_{18}}$$

Answer _____

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

$$\mathbf{5.3mg\ CO_2\ X\ \frac{10^{-3}g}{1mg}\ X\ \frac{1mol\ CO_2}{44.0g\ CO_2}\ X\ \frac{18mol\ H_2O}{16mol\ CO_2}\ X\ \frac{18.0g\ H_2O}{1mol\ H_2O} =}$$

$$\mathbf{2.4 \times 10^{-3}\ g\ H_2O}$$

Answer _____

d. How many grams of oxygen are needed to react with 7.22×10^{24} molecules of C_8H_{18}?

$$\mathbf{7.22 \times 10^{24} molec.\ C_8H_{18}\ X\ \frac{1mol\ C_8H_{18}}{6.02 \times 10^{23} molec}\ X\ \frac{25mol\ O_2}{2mol\ C_8H_{18}}\ X\ \frac{32.0g\ O_2}{1mol\ O_2} =}$$

$$\mathbf{4.80 \times 10^{3} g\ O_2}$$

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

$$\mathbf{4\ Al\ +\ 3\ O_2\ \text{---> }\ 2\ Al_2O_3}$$

b. Calculate the number of grams of aluminum oxide produced

$$\mathbf{25.0g\ Al\ X\ \frac{1mol\ Al}{27.0g\ Al}\ X\ \frac{1mol\ Al_2O_3}{2mol\ Al}\ X\ \frac{102.0g\ Al_2O_3}{1mol\ Al_2O_3} = 47.2g\ Al_2O_3}$$

Answer _____

3] A sample of $TiCl_4$ is reacted with Titanium metal to produce Titanium (III) chloride

a. Write the balanced equation

$$\mathbf{3\ TiCl_4\ +\ Ti\ \text{---> }\ 4\ TiCl_3}$$

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

$$\mathbf{52\ Kg\ TiCl_4\ X\ \frac{10^{3}g}{1Kg}\ X\ \frac{1mol\ TiCl_4}{189.9g\ TiCl_4}\ X\ \frac{4mol\ TiCl_3}{3mol\ TiCl_4}\ X\ \frac{154.4g\ TiCl_3}{1mol\ TiCl_3}\ X\ \frac{10^{-3}Kg}{1g} =}$$

$$\mathbf{56.4\ Kg\ TiCl_3}$$

Answer _____

4] Given the equation: $Al_4C_3 + 12\ H_2O \rightarrow 4Al(OH)_3 + 3\ CH_4$

a. How many grams of water are needed to react with 100.0 moles of Al_4C_3?

$$\mathbf{100.0mol\ Al_4C_3 \times \frac{12mol\ H_2O}{1mol\ Al_4C_3} \times \frac{18.01g\ H_2O}{1mol\ H_2O} = 2.160 \times 10^4 g\ H_2O}$$

Answer _____

b. How many moles of Al_4C_3 were reacted when 3.55×10^{35} formulas units of aluminum hydroxide were produced?

$$\mathbf{3.55 \times 10^{35}\ formula\ units\ Al(OH)_3 \times \frac{1mol\ Al(OH)_3}{6.02 \times 10^{23}\ form.\ units} \times \frac{1mol\ Al_4C_3}{4mol\ Al(OH)_3} =}$$

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

Answer _____

c. How many grams of aluminum hydroxide were produced when 673 mg of CH_4 were formed.?

$$\mathbf{673\ mg\ CH_4 \times \frac{10^{-3} g}{1mg} \times \frac{1mol\ CH_4}{16.0g\ CH_4} \times \frac{4mol\ Al(OH)_3}{3mol\ CH_4} \times \frac{78.0g\ Al(OH)_3}{1mol\ Al(OH)_3} =}$$

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

Answer _____

5] Given the reaction:

$$4\ C + Na_2CO_3 + N_2 \rightarrow 2\ NaCN + 3\ CO$$

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

a. How many moles of carbon monoxide were produced?

181g total Na_2CO_3 - 35g unreacted Na_2CO_3 = 146 g Na_2CO_3 reacted

$$\mathbf{146g\ Na_2CO_3 \times \frac{1mol\ Na_2CO_3}{106.0g\ Na_2CO_3} \times \frac{3mol\ CO}{1mol\ Na_2CO_3} = 4.13\ mol\ CO}$$

Answer _____

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

$$\mathbf{146g\ Na_2CO_3 \times \frac{1mol\ Na_2CO_3}{106.0g} \times \frac{1mol\ N_2}{1mol\ Na_2CO_3} \times \frac{28.0g\ N_2}{1mol\ N_2} = 38.6\ g\ N_2}$$

Answer _____