Mole Ratio Practice

Part 1 Directions: Write the balanced equation and solve each of the following:

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1. Aluminum metal (Al) and hydrogen chloride (HCl) react to form aluminum chloride ($AlCl_3$) and hydrogen gas (H_2). $2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$

a. How many moles of aluminum metal are needed to produce 3.33 moles of aluminum chloride? $3.33\ mol\ AlCl_3 \mid 2\ moles\ Al \;/\; 2\ mole\ AlCl_3 = 3.33\ moles\ Al$

b. How many moles of hydrogen chloride are needed to react with this number of moles of aluminum metal? $3.33\ moles\ Al \mid 6\ HCl \;/\; 2\ Al = 9.99\ mol\ HCl$

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2. Aluminum bromide ($AlBr_3$) and sodium hydroxide (NaOH) react to form aluminum hydroxide ($Al(OH)_3$) and sodium bromide (NaBr). $AlBr_3 + 3NaOH \longrightarrow Al(OH)_3 + 3NaBr$

a. How many moles of sodium bromide can be formed from 1.55 moles of aluminum bromide? $1.55\ mol\ AlBr_3 \mid 3\ NaBr \;/\; 1\ AlBr_3 = 4.65\ mol\ NaBr$

b. How many moles of aluminum hydroxide may be formed from 4.65 moles of sodium hydroxide (NaOH)? $4.65\ NaOH \mid 1\ Al(OH)_3 \;/\; 3\ NaOH = 1.55\ mol\ Al(OH)_3$

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3. Methane gas (CH_4) reacts with oxygen gas (O_2) to form carbon dioxide (CO_2) and water. $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

a. How many moles of CH_4 are needed to produce 3.5×10^{-4} moles of carbon dioxide? $3.5 \times 10^{-4}\ moles\ CO_2 \mid 1\ CH_4 \;/\; 1\ CO_2 = 3.5 \times 10^{-4}\ moles\ CH_4$

b. How many moles of oxygen are needed to react to form the 3.5×10^{-4} moles of carbon dioxide? $3.5 \times 10^{-4}\ CO_2 \mid 2\ mol\ O_2 \;/\; 1\ mol\ CO_2 = .0007\ mol\ O_2$

4. Nitrogen gas (N_2) combine with hydrogen gas (H_2) to create ammonia (NH_3). $N_2 + 3H_2 \longrightarrow 2NH_3$

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a) If you used 1 mole of N_2, how many moles of NH_3 could be produced? $1\ mol\ N_2 \mid 2\ NH_3 \;/\; 1\ N_2 = 2\ mol\ NH_3$

b) If 10 moles of NH_3 were produced, how many moles of N_2 would be used? $10\ mol\ NH_3 \mid 1\ N_2 \;/\; 2\ NH_3 = 5\ mol\ N_2$

~~c) If 3.00 moles of H_2 were used, how many moles of NH_3 would be made?~~

~~d) If 0.600 moles of NH_3 were produced, how many moles of H_2 were used?~~

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5. Hydrogen gas (H_2) can be mixed with oxygen (O_2) to create water.

a) What is the H_2 / H_2O molar ratio? $2H_2 + O_2 \longrightarrow 2H_2O$

b) Suppose you had 25 moles of H2 on hand and plenty of O_2, how many moles of H_2O could you make?

$25\ mol\ H_2 \mid 2\ H_2O\ moles \;/\; 2\ H_2\ moles = 25\ H_2O\ moles$

Limiting Reagent Worksheet #1

1. Given the following reaction: (Balance the equation first!)

$$C_3H_8 + O_2 \longrightarrow CO_2 + H_2O$$

a) If you start with 14.8 g of C_3H_8 and 3.44 g of O_2, determine the limiting reagent

b) determine the number of moles of carbon dioxide produced

c) determine the number of grams of H_2O produced

d) determine the number of grams of excess reagent left

2. Given the following equation:

$$Al_2(SO_3)_3 + 6\,NaOH \longrightarrow 3\,Na_2SO_3 + 2\,Al(OH)_3$$

a) If 10.0 g of $Al_2(SO_3)_3$ is reacted with 10.0 g of NaOH, determine the limiting reagent

b) Determine the number of moles of $Al(OH)_3$ produced

c) Determine the number of grams of Na_2SO_3 produced

d) Determine the number of grams of excess reagent left over in the reaction

3. Given the following equation:

$$Al_2O_3 + Fe \longrightarrow Fe_3O_4 + Al$$

a) If 25.4 g of Al_2O_3 is reacted with 10.2 g of Fe, determine the limiting reagent

b) Determine the number of moles of Al produced

c) Determine the number of grams of Fe_3O_4 produced

d) Determine the number of grams of excess reagent left over in the reaction