KEY

Stoichiometry Homework #1

1. In the formation of carbon dioxide from carbon monoxide and oxygen, how many moles of carbon monoxide are needed to react completely with 7.0 moles of oxygen gas?

want: mol CO

given: 7.0 mol O_2

$2CO(g) + O_2(g) \rightarrow 2CO_2(g)$

$$7.0 \text{ mol } O_2 \left| \frac{2 \text{ mol CO}}{1 \text{ mol } O_2} \right. = \boxed{14 \text{ mol CO}}$$

2. How many moles of oxygen are required to burn 22.4 liters of ethane gas, C_2H_6, at standard conditions?

want: mol O_2

given: 22.4 L C_2H_6

$2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$

$$22.4 \text{ L } C_2H_6 \left| \frac{1 \text{ mol } C_2H_6}{22.4 \text{ L } C_2H_6} \right. \left| \frac{7 \text{ mol } O_2}{2 \text{ mol } C_2H_6} \right. = \boxed{3.50 \text{ mol } O_2}$$

3. Suppose that an excess of propane, C_3H_8, burns in 320 g of O_2. How many moles of H_2O will be formed?

want: mol H_2O

given: 320 g O_2

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

$$320 \text{ g } O_2 \left| \frac{1 \text{ mol } O_2}{32 \text{ g } O_2} \right. \left| \frac{4 \text{ mol } H_2O}{5 \text{ mol } O_2} \right. = \boxed{8.0 \text{ mol } H_2O}$$

4. Ammonia, NH_3, is commercially prepared by the Haber process. How many moles of ammonia can be formed from 44.8 liters of nitrogen gas and an excess of hydrogen at standard conditions?

want: mol NH_3

given: 44.8 L N_2

$3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$

$$44.8\ L\ N_2 \left| \frac{1\ mol\ N_2}{22.4\ L\ N_2} \right| \frac{2\ mol\ NH_3}{1\ mol\ N_2} = \boxed{4.00\ mol\ NH_3}$$

5. How many liters of hydrogen, H_2, are needed to react with 10. liters of nitrogen gas in the reaction forming ammonia?

want: L H_2

given: 10. L N_2

$3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$

$$10.\ L\ N_2 \left| \frac{1\ mol\ N_2}{22.4\ L\ N_2} \right| \frac{3\ mol\ H_2}{1\ mol\ N_2} \left| \frac{22.4\ L\ H_2}{1\ mol\ H_2} \right| = \boxed{30.\ L\ H_2}$$

6. How many grams of calcium must react with sulfuric acid, H_2SO_4, in order to produce 5.6 liters of hydrogen gas?

want: g Ca

given: 5.6 L H_2

$Ca + H_2SO_4 \rightarrow CaSO_4 + H_2$

$$5.6\ L\ H_2 \left| \frac{1\ mol\ H_2}{22.4\ L} \right| \frac{1\ mol\ Ca}{1\ mol\ H_2} \left| \frac{40.08\ g\ Ca}{1\ mol\ Ca} \right| = \boxed{10.\ g\ Ca}$$

ANSWERS:

1) 14 mol CO_2	2) 3.50 mol O_2	3) 8.0 mol H_2O
4) 4.00 mol NH_3	5) 30. L H_2	6) 10. g Ca

http://wongchemistry.weebly.com/unit-63--stoichiometry.html