

Stoichiometry Homework #1

KEY

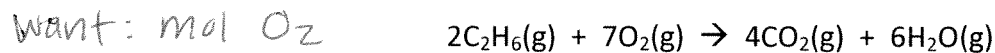
1. In the formation of carbon dioxide from carbon monoxide and oxygen, how many moles of carbon monoxide are needed to react completely with 7.0 moles of oxygen gas?



given: 7.0 mol O₂

$$\frac{7.0 \text{ mol O}_2}{1 \text{ mol O}_2} \times \frac{2 \text{ mol CO}}{1 \text{ mol O}_2} = \boxed{14 \text{ mol CO}}$$

2. How many moles of oxygen are required to burn 22.4 liters of ethane gas, C₂H₆, at standard conditions?



given: 22.4 L C₂H₆

$$\frac{22.4 \text{ L C}_2\text{H}_6}{22.4 \text{ L C}_2\text{H}_6} \times \frac{1 \text{ mol C}_2\text{H}_6}{2 \text{ mol C}_2\text{H}_6} \times \frac{7 \text{ mol O}_2}{1 \text{ mol C}_2\text{H}_6} = \boxed{3.50 \text{ mol O}_2}$$

3. Suppose that an excess of propane, C₃H₈, burns in 320 g of O₂. How many moles of H₂O will be formed?



given: 320 g O₂

$$\frac{320 \text{ g O}_2}{32 \text{ g O}_2} \times \frac{1 \text{ mol O}_2}{1 \text{ mol O}_2} \times \frac{4 \text{ mol H}_2\text{O}}{5 \text{ mol O}_2} = \boxed{8.0 \text{ mol H}_2\text{O}}$$

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?



given: 44.8 L N_2

$$\frac{44.8 \text{ L } \text{N}_2}{22.4 \text{ L } \text{N}_2} \times \frac{1 \text{ mol } \text{N}_2}{1 \text{ mol } \text{N}_2} \times \frac{2 \text{ mol } \text{NH}_3}{1 \text{ mol } \text{N}_2} = \boxed{4.00 \text{ mol } \text{NH}_3}$$

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



given: 10. L N_2

$$\frac{10. \text{ L } \text{N}_2}{22.4 \text{ L } \text{N}_2} \times \frac{1 \text{ mol } \text{N}_2}{1 \text{ mol } \text{N}_2} \times \frac{3 \text{ mol } \text{H}_2}{1 \text{ mol } \text{N}_2} \times \frac{22.4 \text{ L } \text{H}_2}{1 \text{ mol } \text{H}_2} = \boxed{30. \text{ L } \text{H}_2}$$

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



given: 5.6 L H_2

$$\frac{5.6 \text{ L } \text{H}_2}{22.4 \text{ L } \text{H}_2} \times \frac{1 \text{ mol } \text{H}_2}{1 \text{ mol } \text{H}_2} \times \frac{1 \text{ mol } \text{Ca}}{1 \text{ mol } \text{H}_2} \times \frac{40.08 \text{ g Ca}}{1 \text{ mol Ca}} = \boxed{10. \text{ g Ca}}$$

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

