

NAME: Key DATE: \_\_\_\_\_ PERIOD: \_\_\_\_\_

# GAS STOICHIOMETRY PROBLEMS WORKSHEET 1

1. Given the unbalanced decomposition reaction of baking soda:



42.0 grams of baking soda? What volumes of carbon dioxide and water are produced at STP?

$$42.0 \text{ g NaHCO}_3 \times \frac{1 \text{ mol NaHCO}_3}{84.0 \text{ g NaHCO}_3} \times \frac{1 \text{ mol CO}_2}{2 \text{ mol NaHCO}_3} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = \boxed{5.6 \text{ L CO}_2}$$

$$42.0 \text{ g NaHCO}_3 \times \frac{1 \text{ mol NaHCO}_3}{84.0 \text{ g NaHCO}_3} \times \frac{1 \text{ mol H}_2\text{O}}{2 \text{ mol NaHCO}_3} \times \frac{22.4 \text{ L H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = \boxed{5.6 \text{ L H}_2\text{O}}$$

2. The catalytic decomposition of hydrogen peroxide is:



Balance the reaction. How many moles of water and oxygen are produced by the decomposition of 68.0 grams of hydrogen peroxide? How many molecules of water and oxygen are produced? How many grams of each product are formed?

$$68 \text{ g H}_2\text{O}_2 \times \frac{1 \text{ mol H}_2\text{O}_2}{34.0 \text{ g H}_2\text{O}_2} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol H}_2\text{O}_2} = \boxed{2.00 \text{ mol H}_2\text{O}}$$

$$68 \text{ g H}_2\text{O}_2 \times \frac{1 \text{ mol H}_2\text{O}_2}{34.0 \text{ g H}_2\text{O}_2} \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}_2} = \boxed{1.00 \text{ mol O}_2}$$

$$68 \text{ g H}_2\text{O}_2 \times \frac{1 \text{ mol H}_2\text{O}_2}{34.0 \text{ g H}_2\text{O}_2} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol H}_2\text{O}_2} \times \frac{1.806 \times 10^{24} \text{ molecules}}{1 \text{ mol H}_2\text{O}} = \boxed{3.61 \times 10^{24} \text{ molecules H}_2\text{O}}$$

$$68 \text{ g H}_2\text{O}_2 \times \frac{1 \text{ mol H}_2\text{O}_2}{34.0 \text{ g H}_2\text{O}_2} \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}_2} \times \frac{1.806 \times 10^{24} \text{ molecules}}{1 \text{ mol O}_2} = \boxed{1.81 \times 10^{24} \text{ molecules O}_2}$$

$$68 \text{ g H}_2\text{O}_2 \times \frac{1 \text{ mol H}_2\text{O}_2}{34.0 \text{ g H}_2\text{O}_2} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol H}_2\text{O}_2} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = \boxed{36.04 \text{ g H}_2\text{O}}$$

$$68 \text{ g H}_2\text{O}_2 \times \frac{1 \text{ mol H}_2\text{O}_2}{34.0 \text{ g H}_2\text{O}_2} \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}_2} \times \frac{32.00 \text{ g O}_2}{1 \text{ mol O}_2} = \boxed{31.96 \text{ g O}_2}$$

3. If 156.0 grams of potassium metal reacts with excess water, potassium hydroxide and hydrogen gas are formed? What volume of hydrogen gas, in liters,

Be sure to balance the reaction first.



$$156 \text{ g K} \times \frac{1 \text{ mol K}}{39.09 \text{ g K}} \times \frac{1 \text{ mol H}_2}{2 \text{ mol K}} \times \frac{22.4 \text{ L H}_2}{1 \text{ mol H}_2} = \boxed{44.70 \text{ L H}_2}$$

$$156 \text{ g K} \times \frac{1 \text{ mol K}}{39.09 \text{ g K}} \times \frac{2 \text{ mol KOH}}{2 \text{ mol K}} \times \frac{56.11 \text{ g KOH}}{1 \text{ mol KOH}} = \boxed{89.39 \text{ g KOH}}$$

4. Determine the number of moles of carbon dioxide gas, water, and sodium chloride formed by the reaction of 42.0 grams of sodium bicarbonate (baking soda) reacting with excess hydrochloric acid. The reaction is:



$$42 \text{ g NaHCO}_3 \times \frac{1 \text{ mol NaHCO}_3}{84.0 \text{ g NaHCO}_3} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol NaHCO}_3} = \boxed{0.5 \text{ mol CO}_2}$$

$$42 \text{ g NaHCO}_3 \times \frac{1 \text{ mol NaHCO}_3}{84.0 \text{ g NaHCO}_3} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol NaHCO}_3} = \boxed{0.5 \text{ mol H}_2\text{O}}$$

$$42 \text{ g NaHCO}_3 \times \frac{1 \text{ mol NaHCO}_3}{84.0 \text{ g NaHCO}_3} \times \frac{1 \text{ mol NaCl}}{1 \text{ mol NaHCO}_3} = \boxed{0.5 \text{ mol NaCl}}$$

# Gas Stoichiometry Problems With Answers

**AN Whitehead**



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