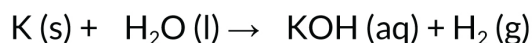


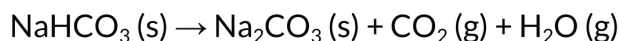
Name : _____ Date : _____

(GAS STOICHIOMETRY PROBLEMS)

1. 156 grams of potassium metal reacts with excess water to form potassium hydroxide and hydrogen gas. Balance the reaction. What volume of hydrogen gas, in liters, is formed?

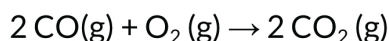


2. Baking soda decomposes at 200 °C to sodium carbonate, water, and carbon dioxide, as shown in the unbalanced reaction below.



Balance the reaction. 42 grams of baking soda is used in the reaction? What volumes of carbon dioxide and water are produced in the reaction?

3. For the following reaction:



1.5 mol of CO and 2.0 mol of oxygen react in a closed 10 L vessel.

a. How many moles of CO, O₂, and CO₂ are present at the end of the reaction?

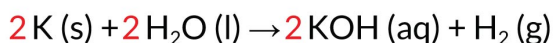
b. What will be the total pressure in the flask at 273 K?

Name : _____ Date : _____

(GAS STOICHIOMETRY PROBLEMS)

Answers

1. 156 grams of potassium metal reacts with excess water to form potassium hydroxide and hydrogen gas. Balance the reaction. What volume of hydrogen gas, in liters, is formed?



$$156\text{ g K} \times (1\text{ mol K}/39.03\text{ g K}) \times (1\text{ mol H}_2/2\text{ mol K}) \times (22.4\text{ L H}_2/1\text{ mol H}_2) = 44.07\text{ L H}_2$$

2. Baking soda decomposes at 200 °C to sodium carbonate, water, and carbon dioxide, as shown in the unbalanced reaction below.

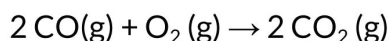


Balance the reaction. 42 grams of baking soda is used in the reaction? What volumes of carbon dioxide and water are produced in the reaction?

$$42\text{ g NaHCO}_3 \times (1\text{ mol NaHCO}_3 / 84.01\text{ g NaHCO}_3) \times (1\text{ mol CO}_2 / 2\text{ mol NaHCO}_3) \times (22.4\text{ L CO}_2 / 1\text{ mol CO}_2) = 5.6\text{ L CO}_2$$

$$42\text{ g NaHCO}_3 \times (1\text{ mol NaHCO}_3 / 84.01\text{ g NaHCO}_3) \times (1\text{ mol H}_2\text{O} / 2\text{ mol NaHCO}_3) \times (22.4\text{ L H}_2\text{O} / 1\text{ mol H}_2\text{O}) = 5.6\text{ L H}_2\text{O}$$

3. For the following reaction:



1.5 mol of CO and 2.0 mol of oxygen react in a closed 10 L vessel.

a. How many moles of CO, O₂, and CO₂ are present at the end of the reaction?

$$1.5\text{ mol CO} \times (2\text{ mol CO}_2 / 2\text{ mol CO}) = 1.5\text{ mol CO}_2$$

$$2\text{ mol O}_2 \times (2\text{ mol CO}_2 / 1\text{ mol O}_2) = 4\text{ mol CO}_2$$

The lower number of moles is the amount of CO₂ produced

$$1.5\text{ mol CO} \times (1\text{ mol O}_2 / 2\text{ mol CO}) = 0.75\text{ mol O}_2\text{ used}$$

$$2\text{ mol O}_2 - 0.75\text{ mol} = 1.25\text{ mol O}_2\text{ remaining}$$

b. What will be the total pressure in the flask at 273 K?

$$\text{Total number of moles of the gas} = 1.5\text{ mol} + 1.25\text{ mol} = 2.75\text{ mol}$$

$$P = nRT/V = (2.75\text{ mol} \times 0.082\text{ L-atm mol}^{-1}\text{ K}^{-1} \times 273\text{ K}) / 10\text{ L} = 6.156\text{ atm}$$