

Ch 13 Part 2

Warm Up!

How many grams of oxygen are needed for the combustion of 15.3 L of methane (CH_4) gas if the pressure is 0.987 atm at standard temp?

Write and balance the equation.

Calculate grams of O_2

Today's Agenda

- QOTD: How can we solve multistep stoichiometry problems involving limiting reactants and partial pressures?
- Example Stoichiometry problems
- Practice problems

Copy Down and Solve

- With the addition of heat, calcium carbonate decomposes into calcium oxide and carbon dioxide. Calculate the volume of carbon dioxide liberated by heating 25.0 grams of calcium carbonate at 1000.0°C and 1.00 atm pressure.
- A 3.00 iron nail is put into rigid 15.0 L container with oxygen at 104 kPa and 303 K and left to rust (Fe_2O_3). The new mass of the nail is 3.25 g. Assuming temperature remains constant, what is the new pressure inside the container.

Warm Up

- 3.6 g of KCl reacts with 5.25 g Na_2SO_4
- Write the balanced chemical equation.
- Which reactant is limiting?
- How much NaCl is produced in grams?

Today's Agenda

- QOTD: How does the ideal gas law affect limiting reactant and partial pressure calculations?
- Limiting reactant with gases
- Partial Pressures
- Collecting gases over water.

Limiting Reactant with Gases

- 3.50 g of magnesium metal is added to 0.1 L of hydrochloric acid. The substances react to completion. How many liters of pure hydrogen gas, measured at 10.0°C and 1.05 atm are produced in this reaction?

Your Turn

- CH_3OH is synthesized by using a catalyst to react carbon monoxide with hydrogen at high temperature, 530 K & pressure 4.21 atm.

Assuming that 0.45 L of CO and 0.825 L of H_2 are allowed to react:

- a. Write the balanced chemical equation
- b. Which reactant is in excess?
- c. What volume of CH_3OH is produced?

Your Turn!

- Calculate the pressure of hydrogen gas if 455 mL is evolved at 35.0°C by reacting 1.20 g of magnesium metal with excess hydrochloric acid.
- If 3.3 grams of H₂ reacts with 12 L of O₂ gas to form water vapor at 380 K and 1.12 atm, how many liters of water vapor are produced? (you are given 2 reactant amounts!)

Partial Pressure and Ideal Gases

- Remember $\chi P_t = P$?!
- A rigid container contains 0.25 L of N_2 and 0.46 L of Cl_2 at a total pressure of 1.32 atm at 300 K. What is the partial pressure of each gas?

Your Turn

- A rigid container contains 340 mL of Ar and 430 mL of H₂ at a total pressure of 780 mmHg at standard temperature. What is the partial pressure of each gas?
- 2.3 g of O₂ is combined with 5.1 g of Ne gas in a 3 L tank at standard temperature. What is the pressure due to each gas? What is the total pressure in the tank?

Collecting Gases over Water

- 0.193 L of O₂ was collected over water on a day when the atmospheric pressure was 762 mmHg. The temperature of the water was 296 K. How many grams of oxygen were collected? (At 296K the vapor pressure of water is 21.1 mmHg.)
- $P_{\text{gas}} + P_{\text{water}} = P_{\text{total}}$
- Use P_{gas} to find moles of O₂ and convert to grams!

Practice!

- 24.3 mL of hydrogen gas was collected over water at 289.4 K and 756.2 mm Hg. Find the partial pressure of the gas at these conditions. (At 289.4 K the vapor pressure of water is 23.8 mm Hg.)
- How many grams of hydrogen gas are collected?