

Stoichiometry of Gases Worksheet

For each of the problems below follow these steps:

1. Write the balanced chemical equations for all questions.
2. Write down the given and required below formulas.
3. Then start solving the questions

Upload your solutions to our site <https://onstudy.ca> SCH3U: Unit 5, Lesson 5

Sample Problem

What volume of carbon dioxide is produced when 6.40 g of ethane gas, C_2H_6 , reacts with excess oxygen? All gases are at $35.0^\circ C$ and 100.0 kPa .

$2C_2H_6(g)$ +	$7O_2(g)$ →	$4 CO_2(g)$ +	$6 H_2O(g)$
m = 6.40 g M = 30.08 g/mol n = 0.213 mol		V = ? T = $35\text{ C} = 308.15\text{ K}$ P = 100 kPa	

Convert moles C_2H_6 to moles of CO_2 using mole ratio:

$$0.213\text{ mol } C_2H_6 \times \frac{4\text{ mol } CO_2}{2\text{ mol } C_2H_6} = 0.426\text{ mol } CO_2$$

Next, use Ideal Gas Law : $PV = nRT$ and solve for V_{CO_2}

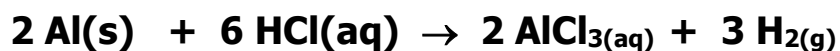
$$V = \frac{nRT}{P} = \frac{(0.426\text{ mol } CO_2) \left(8.314 \frac{\text{kPa}\cdot\text{L}}{\text{mol}\cdot\text{K}} \right) (308.15\text{ K})}{(100\text{ kPa})}$$

$$V_{CO_2} = 10.9\text{ L}$$

Practice Problems:

1. Hydrogen gas is produced when aluminum metal is added to hydrochloric acid. What mass of aluminum is necessary to produce 20.0 L of hydrogen at SATP?

Write the balance chemical equation:

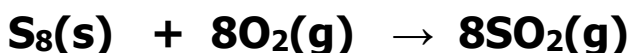


$2 \text{ Al(s)} + 6 \text{ HCl(aq)} \rightarrow$	$2 \text{ AlCl}_3\text{(aq)}$	$+ 3 \text{ H}_2\text{(g)}$

A: 7.26 g Al

2. The first step in the industrial manufacture of sulfuric acid is the complete combustion of Octasulfur, $\text{S}_8\text{(s)}$. What mass of octasulfur is required to produce 112 L of sulfur dioxide at STP?

Write the balance chemical equation:



A: 160 g S_8

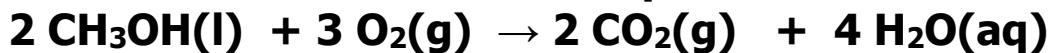
3. 7.5 kg of hydrogen gas and excess nitrogen gas is reacted in a vessel. What volume of ammonia at 450 kPa pressure and 80.0°C can be obtained from the complete reaction of nitrogen and hydrogen gas?

Write the balance chemical equation:

A: 1.6×10^4 L of NH_3

4. What volume of oxygen at STP is needed to completely burn 15.0 g of methanol (CH_3OH) in a burner?

Write the balance chemical equation:



A: 15.8 L of O₂

5. Most combustion reactions use oxygen from the air (assume 20% oxygen). What mass of propane (C₃H₈) from a tank can be burned using 125 L of air at SATP?

Write the balance chemical equation:



A: 8.82 g of propane must be burned

6. What volume of oxygen gas at **room conditions** is obtained from the decomposition of 50.0 mL of 0.880 mol/L aqueous hydrogen peroxide (H₂O₂)?

Write the balance chemical equation:



A: 0.545 L or 545 mL of O₂

7. What volume of oxygen at 40.0°C and 1.50 atm is necessary to burn 300 L of hydrogen gas measured at the same conditions?

Hint: all reactants and products are at the same conditions thus use law of combining volumes.

Write the balance chemical equation:



A: 150 L of O₂