

Chapter 13 Study Questions

NOTE: Vapor Pressure of Water Chart is on the back of this page.

1. A flask contains air at 722 mm Hg and 22°C. What would the temperature of the gas be if the pressure is increased to 1.07 atm?
2. A sample of air collected at STP contains 0.039 moles of N₂, 0.010 moles of O₂, and 0.001 moles of Ar. (Assume no other gases are present.)
 - a) Find the partial pressure of O₂.
 - b) What is the volume of the container?
3. A sample of hydrogen gas (H₂) is collected over water at 19°C.
 - a) What are the partial pressures of H₂ and water vapor if the total pressure is 756 mm Hg?
 - b) What is the partial pressure of hydrogen gas in atmospheres?
4. If 600 cm³ of H₂ at 25°C and 750 mm Hg is compressed to a volume of 480 cm³ at 41°C, what does the pressure become?
5. Find the density of helium gas at STP.
6.
 - a) Write a balanced chemical equation for the reaction of butane gas with oxygen gas to form carbon dioxide and water vapor.
 - b) How many liters of oxygen are required to produce 2.0 liters of CO₂?
 - c) How many liters of CO₂ are produced from 11.6 g of butane at STP?
 - d) How many molecules of water vapor are produced from 5.6 liters of butane gas at STP?
7. A flask contains 0.25 moles of argon and 0.75 moles of helium. If the partial pressure of the helium is 0.60 atm, what is the total pressure in the flask?
8. Calculate the density of carbon dioxide at 546 K and 4.00 atmospheres pressure.
9. How many grams of methane are contained in a 28.0 liter flask at 68°C and 2.00 atmospheres pressure?
10. What volume of O₂ at 710 mm Hg pressure and 36°C is required to react with 6.52 g of CuS?
$$\text{CuS}(s) + 2 \text{O}_2(g) \rightarrow \text{CuSO}_4(s)$$
11. What is the molar mass of a gas if 7.00 grams occupy 6.20 liters at 29°C and 760 mm Hg pressure?
12. At a particular temperature and pressure, 15.0 g of CO₂ occupy 7.16 liters. What is the volume of 12.0 g of CH₄ at the same temperature and pressure?

Summary of Chapter 13: Gases

Kinetic-molecular theory

pressure

barometer, manometer

$$1 \text{ atm} = 760 \text{ mmHg} = 760 \text{ torr}$$

temperature

absolute zero temperature

$$T(\text{K}) = T(^{\circ}\text{C}) + 273$$

relationship between pressure, volume, temperature

Boyle's Law

Charles' Law

Avogadro's Law

Ideal Gas Law

$$R = 0.08206 \text{ L atm/mol K}$$

partial pressure

molar volume

STP

molar volume @ STP = 22.4 L

gas stoichiometry

molar mass and density of a gas

formulas:

$$P_{\text{total}} = P_x + P_y + \dots$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$PV = nRT; R = 0.08206 \text{ L atm/mol K}$$

$$d = \frac{mm}{mV}$$

$$P_1 = \left(\frac{n_1}{n_T} \right) P_T$$

Vapor Pressure of Water

Temp ($^{\circ}\text{C}$)	15	16	17	18	19	20	21	22	23	24	25
$P_{\text{H}_2\text{O}}$ (mm Hg)	13	14	15	15	16	18	19	20	21	22	24