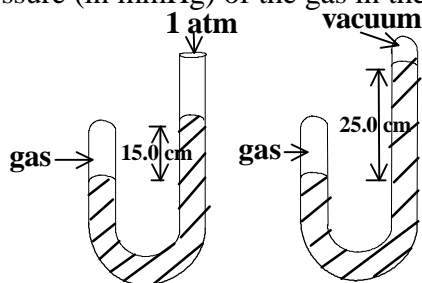


CHEM 1

Problem Set Ch. 5

1. Define pressure and give the common units for pressure.
2. Calculate the pressure (in mmHg) of the gas in the arrangements shown in the illustration below. The liquid is mercury.



3. A sample of nitrogen gas (N_2) occupies 32.0 cubic feet at 757 mm Hg. Calculate its volume at 645 mm Hg at constant temperature.
4. Anesthetic gas is normally given to a patient when the room temperature is $20.0\text{ }^\circ\text{C}$ and the patient's body temperature is $37.0\text{ }^\circ\text{C}$. What would this volume, 1600 mL, of gas change to if the pressure and mass stay constant?
5. A sample of a gas in a rigid container at $-23\text{ }^\circ\text{C}$ is at a pressure of 500 torr. What temperature will be necessary to change the pressure to 800 torr?
6. A sample of O_2 gas occupies a volume of 1.62 L at 755 torr pressure and has a temperature of $0\text{ }^\circ\text{C}$. what volume will this sample occupy at 725 mmHg pressure and $50\text{ }^\circ\text{C}$.
7. A gas occupies 250 mL at 700 mmHg and 300 K. What volume will the gas occupy at 0.461 atm and $177\text{ }^\circ\text{C}$?
8. A sample of 4.25 mol of hydrogen at $20.0\text{ }^\circ\text{C}$ occupies a volume of 25.0 L. Under what pressure (in atm) is this sample?

9. Calculate the density of He gas at STP.
10. A gas was found to have a density of 1.76 mg/mL at 24.0 °C and a pressure 741 mmHg. What was its molecular weight?
11. How many liters of chlorine at STP are needed to react with 5.00 L of H₂ (also at STP) in the following reaction?
- $$\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2 \text{HCl}(\text{g})$$
12. Propane (C₃H₈) burns in oxygen to produce carbon dioxide gas and water vapor.
- Write a balanced equation for this reaction.
 - Calculate the number of liters of carbon dioxide measured at STP that could be produced from 7.45 g of propane.
13. A sample of synthetic air contains only nitrogen and oxygen gases whose partial pressures are 0.80 atm and 0.20 atm, respectively. Calculate the total pressure and the mole fractions of the gases.
14. A mixture of helium and neon gases is collected over water at 28.0 °C and 745 mmHg. If the partial pressure of helium is 368 mmHg, what is the partial pressure of neon? (Vapor pressure of water at 28 °C = 28.3 mmHg)
15. A helium-filled balloon deflates faster than an air-filled balloon of comparable initial size. Explain.
16. The rate at which argon effuses through a pinhole is 3.56 mL/min. At what rate will hydrogen gas effuse through the same hole under similar conditions?
17. Write the van der Waals equation for a real gas. Explain clearly the meaning of the corrective terms for pressure and volume.

18. Analysis of a newly discovered gaseous silicon-flourine compound show that it contains 33.01 mass % silicon. AT 27 °C, 2.60 g of the compound exerts a pressure of 1.50 atm in a 0.250 L vessel. what is the molecular formula of the compound?