

Unit 7: Gases

adapted from http://www.phschool.com/advanced/lesson_plans/chem_brown_2003/index.html

Objectives:

- Describe properties of gases compared to other physical states.
- Define common units of gas pressure.
- Describe how gases respond to changes in V , n , P , and T .
- Be able to solve problems using combined and ideal gas equations.
- Be able to calculate molar mass from gas density and vice versa.
- Calculate the partial pressure of any gas from the composition of its mixture.
- Understand the process and calculation of the pressure of a gas collected over water.
- Calculate mole fraction from partial pressure.
- Describe how the relative rates of diffusion and effusion of gases depends on their molar masses.
- Understand the kinetic molecular theory.
- Be able to work through gas stoichiometry problems.
- Understand that real gases deviate from ideal gases especially at high pressure and/or low temperature.
- Know the real gas equation, with corrections for particle attraction and size.

Lab Objectives:

- Observe how gas volume and pressure are determined in the lab and how the gas volume is affected by temperature and pressure.
- Observe how well real gases behave ideally at normal conditions and determine the universal gas constant.

Suggested Labs:

- Behavior of Gases: Molar Mass of a Vapor
- Determination of R : The Gas-Law Constant

Key Words:

pressure,	torr	Dalton's law of partial pressures
Pascal	manometer	mole fraction
Barometer	Avogadro's hypothesis	effusion
Bar	ideal gas	diffusion
std. atmospheric pressure	ideal gas equation	Graham's law
atmosphere,	gas constant (R)	Van der Waal's equation
	standard conditions (STP)	
	partial pressure	

Tips:

- Each gas in a mixture of gases occupies the same volume, the volume of the container.
- Learn one expression of R ($0.0821 \text{ L}\cdot\text{atm}/\text{n}\cdot\text{K}$) using volume in liters and pressure in atm.
- In using Graham's law remember that r is rate, not time. Rate is the reciprocal of time.
- Don't spend a lot of time on real gases, except to understand the corrections for volume of, and the attraction between, gas molecules.

