Unit 7: Gases

Ms. Snyder
Prep Chemistry

Unit Learning Objectives: By the end of the unit students will be able to…

(1) Define pressure using a mathematical equation.
(2) Perform calculations involving pressure, force, and area.
(3) Describe how pressure is measured using a barometer.
(4) Convert pressure between the units of atmospheres, Pascals, and millimeters of Mercury. (5) Perform calculations involving Dalton's Law of partial pressures.
(6) Perform calculations involving Boyle's Law, Charles' Law, and Gay-Lassac's Law.
(7) Solve combined gas law problems.
(8) State the conditions of STP.
(9) Give Avogadro's Law by stating volume of one mole of gas at STP.
(10) Perform calculations for gases at STP involving volume, moles, mass, and atoms/molecules.
(11) Perform calculations using the Ideal Gas Law.
(12) Perform stoichiometric calculations involving volume of gases at STP.

Monday	Tuesday	Wednesday	Thursday	Friday
9 **No School Winter Break**	**10** Gas Demo's, Pressure & Measuring Pressure	**11** Dalton's Law	**12** Boyle's Law	**13** Charles' Law
16 **No School Martin Luther King Jr. Holiday**	**17** Gay-Lussac's Law	**18** **Quiz #1 Gas Laws**	**19** **Writing #3: Stoichiometry**	**20** **Lab:** Testing for Gases
23 Combined Gas Law	**24** Avogadro's Law	**25** Ideal Gas Law	**26** Ideal Gas Law	**27** **Quiz #2: Gas Laws**
30 Gas Stoichiometry	**31** Unit 7 Review For Test	**Feb 1** **Unit 7 Test Part 1: Multiple Choice Only**	**2** Unit 7 Test Review	**3** **Unit 7 Test Part 2: Multiple Choice**

Why are gases gaseous and not liquid or solid?
It depends on three factors:

- _____
- _____
- _____

How can we describe gases?
Kinetic Molecular Theory

- _____
  _____
- _____
  _____
- _____
  _____
- _____
  _____

Ex. A Balloon is filled with helium gas.

An ideal gas is:
_____
_____

A non-ideal gas is:
_____
_____

The earth's atmosphere is composed of a mixture gases:

Pressure:
Pressure: _____

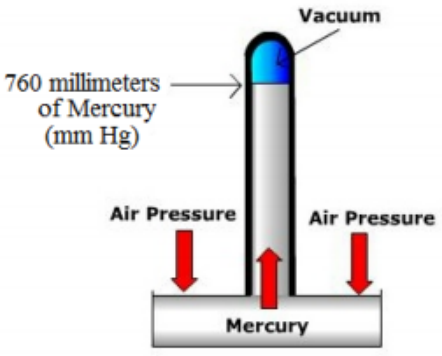
Practice: Calculate the pressure experienced when 150 N of force is applied over 8.0 M^2.

Ex. Calculate the force if 100 Pa of pressure is applied to an area of 125 m^2.

Ex. Calculate the area if 500 N of force creates a pressure of 25 Pa.

Measuring Pressure:

Barometer: the instrument used to measure air pressure. A barometer is filled with mercury (Hg). The pressure of the Earth's atmosphere pushes the mercury up the tube. The greater the air pressure, the higher the mercury in the tube will be.



At sea level, at 0 ºC, the pressure of the Earth's atmosphere (1.00 atm) creates a column of Mercury 760 mm in height. This pressure is equivalent to 101325 pa.

_____ atm = _____ mm Hg = _____ Pa

1 mm of Hg is also called 1 torr.

Practice: Convert the given pressures to the indicated units.
0.850 atm = _____ mm Hg = _____ Pa

What is Air Pressure?

Gas Laws

1. Dalton's Law
The total pressure of a mixture of gases is equal to the sum of the partial pressures of all of the gases in the mixture. When gases are in the mixture, the pressure of each gas is referred to as the "partial" pressure as each gas in the mixture contributes to part of the total pressure.

Practice: A mixture contains nitrogen with a partial pressure of 2.5 atm and oxygen with a partial pressure of 1.5 atm, what is the total pressure of the mixture?

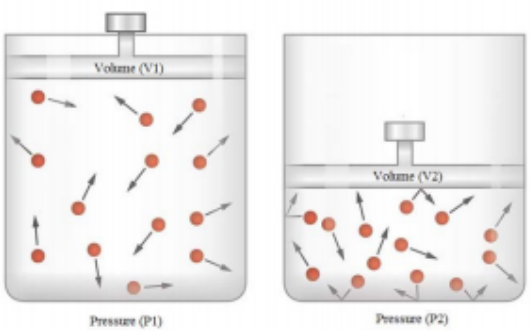
Ex. A mixture of air and ozone has a total pressure of 1.00×10^5 Pa. IF the partial pressure of air is 9.55×10^4 Pa, what is the partial pressure of ozone?

2. Boyle's Law
At a constant temperature, Boyle's Law gives the relationship between changing pressure/volume.

Practice: A sample of argon gas at 0.950 atm of pressure occupies a volume of 1.50 L. What is the volume if the pressure is increased to 1.25 atm?

Ex. A sample of air under 1.50×10^5 Pa of pressure has a volume of 175 mL. What is the pressure if the volume is increased to 200 mL?

When pressure is increased, volume is _____
When volume is increased, pressure is _____

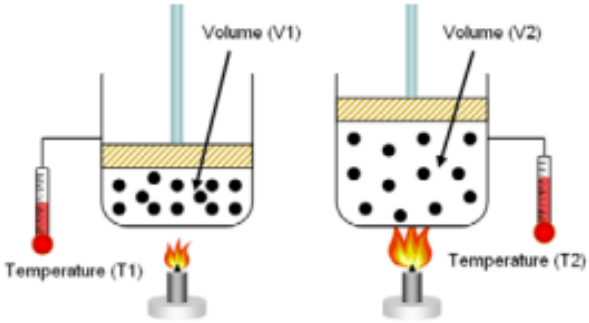


3. Charles' Law
At a constant pressure, Charles' Law gives the relationship between changing volume/temperature.

Practice: A sample of oxygen gas occupies 0.750 L at 300 K. What volume will the gas occupy if the temperature is increased to 400 K?

Ex. A sample of chlorine gas occupies 80.0 mL at 30 ºC. At what temperature will the volume be 50.0 mL?

When temperature is increased, volume is _____
When volume is decreased, temperature is _____



4. Gay-Lussac's Law
At constant volume, Gay-Lussac's Law gives the relationship between changing pressure/temperature.

Practice: A sample of nitrogen gas at 1.2 atm of pressure and 275 K is heated to 350 K. What is the resulting pressure?

Ex. A sample of xenon is under a pressure of 1.30×10^5 Pa at 50 ºC. What is the temperature when the pressure is decreased to 8.90×10^4 Pa?

When temperature is increased, pressure is _____
When pressure is decreased, temperature is _____

5. Combined Gas Law
Gives the relationship between changing pressure/volume/temperature for a gas.

Practice: A balloon filled with helium has a volume of 4.0 L at 20 ºC and 1.04 atm. What is the volume at 25 ºC and 0.90 atm?

6. Avogadro's Law

At Standard Temperature and Pressure (STP), 1 mole of ANY gas will occupy 22.4 L. 1 Mole= 22.4 L

STP= 0ºC and 1.00 atm

Practice: What is the volume of 0.300 mol of gas at STP?

Ex. What is the mass of 0.200 L of Neon at STP?

Ex. How many molecules of nitrogen trifluoride are contained in 125 mL at STP?

7. Ideal Gas Law

Gives the relationship between pressure/volume/temperature/moles of gas for any condition

Practice: What is the volume of a sample containing 0.550 mol of nitrogen gas at 340 K and 1.05×10^5 Pa?

Ex. What is the mass of a 50.0 L sample of helium at 280 K and 0.860 atm?

Ideal Gas Law and Molar Mass

A sample of gas has a mass of 5.00 g and occupies a volume of 800 mL at 1.17 atm and 27 ºC. Determine the molar mass of the gas. Identify the monatomic gas.

Gas Stoichiometry

Ex. Nitrogen and hydrogen combine to form ammonia (NH_3). What volume and mass of nitrogen (at STP) would produce 8.52 g of ammonia?