

Unit Title: Gas Laws

Grade Level: (example: 9, 10, 11, 12 or 7-8) 11,12

Subject Area: (example: Science, Physics; English, Short Stories) Chemistry

Duration/Length/Number of class periods: (example: 5 class periods) 7 days/ 85 minute block schedule

Description: Students will conduct a series of experiments to find the relationships involved with the variables of gases. These relationships will be used to find the ideal gas law. Students will use the Kinetic Molecular Theory to explain these relationships and then use the motion of molecules to explain everyday phenomena involving gases (can crush, fire piston, hand boiler, marshmallows in a vacuum, egg in a bottle, air pressure and fog etc.)

Established Goals (National, State, Local): 9c.2.1.4.1 (2009) New # 9c.2.2.1.1(2022?)

Use kinetic molecular theory to explain how changes in energy content affect the state of matter (solid, liquid and gaseous phases).
Use the kinetic molecular theory to explain the behavior of gases and the relationship among temperature, pressure, volume and the number of particles.

Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.

What Enduring Understandings are desired?

Students will understand the relationships between volume, pressure, temperature, and moles for an ideal gas.
Students will use the Kinetic Molecular Theory and the motion of molecules to explain how those variables affect each other.
Students will use the ideal gas law and/or the combined gas law to solve problems involving the variables for a gas.

What Essential Questions will be considered?

I can explain the direct or inverse relationship of volume, pressure, temperature, and moles for an ideal gas.
I can use the motions of molecules to explain how the molecules/atoms in a gas affect the variables of the ideal gas.
I can use the ideal gas law and/or combined gas law to solve problems involving an ideal gas.

Students will know / be able to:

When students are done with this unit they will understand the relationships of the volume, mole, pressure, and temperature variables of an ideal gas. Students will be able to use the ideal gas law to solve gas problems. Students will be able to use the motion of

molecules and the variables of a gas to explain some demonstrations including crushing a pop can, egg in a bottle, marshmallows in a vacuum, fire piston, and pressure and fog (as well as other great gas law demonstrations)

Description <i>Units must include at least one of each formative, summative, introductory activity and learning activity. Check the appropriate box; one per row.</i>	Fo r m a t i v e	Su m m a t i v e	Intr o d u c t o r y A c t i v i t y	Lea r n i n g A c t i v i t y	Stu d e n t T e c h n o l o g y U s e d	Teac h er T e c h n o l o g y U s e d	I S T E S t a n d a r d s
Can-crush demonstration explanation	x						
Advanced Chemistry with Vernier Labs 30a - Pressure and Volume, 30b - Pressure and Temperature, 30c - Volume and Temperature, 30d - Pressure and moles			X		X		3c,4a
Finding R Lab - Collect the oxygen from the decomposition of sodium chlorate				x		x	
Summary of gas laws labs		x					
Explain the demonstrations - can crush, fire piston, marshmallows in a vacuum, egg in a bottle, pressure and fog				x			
Test on the ideal gas law and motion of molecules Gas Laws Test		x					

Materials, tools and resources Vernier sensors - Pressure and Temperature, LoggerPro software on laptops, Lab equipment

Unit Plan Author Greg Sullivan, Owatonna High School gsullivan@isd761.org