

<b>Unit Title:</b> Gas Laws
<b>Grade Level:</b> 10-12
<b>Subject Area:</b> Science-Chemistry
<b>Duration/Length/Number of class periods:</b> 8-9 47 min class periods
<b>Description:</b> Gas laws unit that moves students through an exploration of the impact of one variable on another leading into a simulation to help address any misconceptions. Then students will create their own lab that will allow them to collect data to graph and analyze that they will present to the class allowing everyone to take notes. Students will complete formative check-ins and a digital summative quiz.
<b>Established Goals (National, State, Local):</b> 9C.2.2.1.1 Develop a data simulation, based on observations and experimental data of how the pressure, volume, temperature, and mass of a gas are related to each other, to predict the effect on a system of changing one of those variables.** (P: 5, CC: 2, CI: PS1) Emphasis is on applying the kinetic molecular theory of gases to develop gas laws. Example systems may include balloons, tires, or syringes.

<b>What <u>Enduring Understandings</u> are desired?</b> How can we use technology to gather, classify and interpret information and visual data?
<b>What <u>Essential Questions</u> will be considered?</b> Why does a bottle of pop fizz when it's opened? Why do aerosol cans have warnings to not be thrown into a fire? Do gas molecules behave differently than solids and liquids when one variable is changed?
<b>Students will know / be able to:</b> Describe how volume, temperature and pressure relate to each other in terms of kinetic molecular theory.

<b>Description</b>  <i>Units must include at least one of each formative, summative, introductory activity and learning activity. Check the appropriate box; one per row.</i>	<a href="#">Fo</a> <a href="#">rm</a> <a href="#">ati</a> <a href="#">ve</a>	<a href="#">Su</a> <a href="#">m</a> <a href="#">ati</a> <a href="#">ve</a>	Intr odu ctor y Acti vity	Lea rnin g Acti vity	Stu den t Tec hno logy Use d	Teac her Tech nolo gy Used	<a href="#">ISTE</a> <a href="#">Stan</a> <a href="#">dard</a> <a href="#">s</a>
---	---	--	--	----------------------------------	---	---	---

<p><b>Day 1:</b> Groups assigned to lab stations to explore one activity and collaborate to draw conclusions explaining phenomena they observed.</p> <p>Mini lab directions:  <a href="https://docs.google.com/document/d/1KdKY9kbyfKR0PVf4Asw1sWu9dFhzz6kHShtihLZ58gk/edit?usp=sharing">https://docs.google.com/document/d/1KdKY9kbyfKR0PVf4Asw1sWu9dFhzz6kHShtihLZ58gk/edit?usp=sharing</a></p> <p>Enter ideas into Google Doc with limitations (such as 15 word minimum) or padlet  Other lab ideas: <a href="https://serc.carleton.edu/sp/mnstep/activities/35031.html">https://serc.carleton.edu/sp/mnstep/activities/35031.html</a></p> <p>Whole class will be able to view Google Doc or Padlet to see other group ideas</p>			<b>x</b>		<b>x</b>	<b>x</b>	<b>2b</b>
<p><b>Day 2:</b> University of Texas gas law simulator (exploratory to help students reflect on previous conceptions)  <a href="http://ch301.cm.utexas.edu/section2.php?target=gases/kmt/gas-simulator.html">http://ch301.cm.utexas.edu/section2.php?target=gases/kmt/gas-simulator.html</a></p> <p>Student Worksheet to follow simulation (need to edit due to changing unit activities)  <a href="https://docs.google.com/document/d/1c8WY7AHRMkGdHvXjAmmXTFDRZuJze1tJ8W7UcNRPpYU/edit?usp=sharing">https://docs.google.com/document/d/1c8WY7AHRMkGdHvXjAmmXTFDRZuJze1tJ8W7UcNRPpYU/edit?usp=sharing</a></p>	<b>x</b>		<b>x</b>	<b>x</b>	<b>x</b>		
<p><b>Day 3-5:</b> Students design their own lab experience to collect data to analyze (need to create rubric/guidelines)</p> <p>Students will need to select two variables to explore: temp, pressure, volume  Students may be limited due to materials available</p> <ul style="list-style-type: none"> <li>-Access to Google Sheets data entry and graphing tutorial</li> <li>-Access to bluetooth thermometer tutorial</li> <li>-Access to pressure sensor tutorial (check out from science house)</li> <li>-consider purchasing hand pump vacuum and temp/pressure class set</li> </ul>	<b>x</b>			<b>x</b>	<b>x</b>		<b>4a, 4b, 5b</b>
<p><b>Day 6-7:</b> Groups present lab experience, graph and discuss relationship  Provide new/fun presentation options such as Canva, BigHuge Labs, create a slide to add to a class slide deck to use later for review</p> <p>Audience fills out notes sheet with variables, graph, etc.  <a href="https://docs.google.com/document/d/1HUIEKewE45a_MqWbsdGHdhYp1WHglDPN1rCAN3v23q1/edit?usp=sharing">https://docs.google.com/document/d/1HUIEKewE45a_MqWbsdGHdhYp1WHglDPN1rCAN3v23q1/edit?usp=sharing</a></p>	<b>x</b>			<b>x</b>	<b>x</b>		<b>1d,3a-3c, 6a-6, 7a-7c</b>
<p><b>Day 6-7:</b> Formative Exits  Mentimeter (have students answer a question)  Padlet (have students post take-aways or questions)</p>	<b>x</b>			<b>x</b>	<b>x</b>	<b>x</b>	
<p><b>Day 8:</b> Schoology quiz</p>		<b>x</b>		<b>x</b>	<b>x</b>	<b>x</b>	

**Materials, tools and resources**

Bluetooth thermometers, Pressure sensors, hand vacuums (look into purchasing), iPads, paper handout for students to record notes, paper or digital lab directions for introductory lab and rubric for designing individual group labs

**Unit Plan Author (name, school and optional email address or hyperlink to teacher's web page)**

Alison Noah  
Highland Park Senior High School  
[alison.noah@spps.org](mailto:alison.noah@spps.org)

**Additional credit given to**