

Grade & Course: 9 -12 Chemistry		Topic: Gases	Duration: 3 weeks
<p>Georgia Standards and Content: SC5. Obtain, evaluate, and communicate information about the Kinetic Molecular Theory to model atomic and molecular motion in chemical and physical processes. c. Develop and use models to quantitatively, conceptually, and graphically represent the relationships between pressure, volume, temperature, and number of moles of a gas.</p>			
Narrative / Background Information			
<p>Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT) SP55. Obtain, evaluate, and communicate information to compare and contrast the phases of matter as they relate to atomic and molecular motion. a. Ask questions to compare and contrast models depicting the particle arrangement and motion in solids, liquids, gases, and plasmas. b. Plan and carry out investigations to identify the relationships among temperature, pressure, volume, and density of gases in closed systems. (Clarification statement: Using specific Gas laws to perform calculations is beyond the scope of this standard; emphasis should focus on the conceptual understanding of the behavior of gases rather than calculations.)</p>			
<p>Year-Long Anchoring Phenomena: (LEARNING PROCESS) Changes to the measurement of chemicals added to Flint Michigan’s water supply created dangerous levels of lead contamination in the drinking water.</p>			
<p>Unit Phenomenon (LEARNING PROCESS) Car tires “deflate” in the winter.</p>			
<p>MYP Inquiry Statement: Models help us understand relationships between variables and their interactions.</p>			
<p>MYP Global Context: Scientific and Technical Innovation</p>			
<p>Approaches to Learning Skills:</p> <ul style="list-style-type: none"> • Communication skills: read critically and for comprehension • Collaboration skills: delegate and share responsibility for decision making • Information Literacy skills: present information in a variety of formats and platforms 	<p>Disciplinary Core Ideas:</p> <ul style="list-style-type: none"> • Gas Laws • Pressure • Ideal Gas Law • Combined Gas Law • Boyle’s Law • Charles’ Law 	<p>Crosscutting Concepts:</p> <ul style="list-style-type: none"> • Systems and System Models • Stability and Change • Scale, Proportion, and Quantity • Cause and Effect <p>MYP Key and Related Concepts:</p> <p>Key Concepts:</p> <ul style="list-style-type: none"> • Systems • Change <p>Related Concepts:</p> <ul style="list-style-type: none"> • Models • Evidence • Consequences 	
<p>Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)</p> <ul style="list-style-type: none"> • All gases behave the same. • Gases are non-reactive. 			

- All gases are clear.

Key Vocabulary: (KNOWLEDGE & SKILLS)

- Intermolecular forces
- Pressure
- Ideal gas law
- Combined gas law
- Boyle's law
- Charles's law

Inquiry Questions:

Factual - What is pressure at the particle level?

Conceptual - How does changing temperature affect the motion of gas particles?

Debatable - Which variable (temperature, pressure, or volume) has the greatest impact on gas behavior?

MYP Objectives		Summative assessment	
<ul style="list-style-type: none"> • MYP Criterion D (iii): apply scientific language effectively 		Relationship between summative assessment task(s) and statement of inquiry: Students will perform tasks and respond to assessment items that will gauge their mastery of gas laws as required by the Georgia Standards of Excellence. Mastery of these concepts is necessary to move forward in our student of chemical behavior.	
Learning Activities and Experiences	Inquiry & Obtain: (LEARNING PROCESS)	Evaluate: (LEARNING PROCESS)	Communicate: (LEARNING PROCESS)
Weeks 1 to 3: Georgia Standards of Excellence: SC5(c) - Develop and use models to quantitatively, conceptually, and graphically represent the relationships between pressure, volume, temperature, and number of moles of a gas.			
Lesson 1 (Gas Behavior and Kinetic Molecular Theory)	Engage - students will be engaged with the unit phenomenon - <i>why does this happen?</i> Explore - notes on general properties of gases, Kinetic Molecular Theory, and temperature as particle motion (Kelvin scale)	Explain - balloon in hot vs. cold water (focus on particle diagrams → predictions) Elaborate - how do gases relate to other states of matter? why don't we have straightforward "liquid laws" or "solid laws"?	Evaluate - Ticket out the Door or similar daily formative assessment
Lesson 2 (Pressure and Boyle's Law)	Engage - syringe compression predictions Explore - define pressure, Boyle's Law ($P_1V_1 = P_2V_2$)	Explain - mini-lab syringe pressure vs. volume investigation (identify variables and controls) - practice problems with Boyle's Law Elaborate - other units of pressure	Evaluate - Ticket out the Door or similar daily formative assessment (explain results with particle diagrams)
Lesson 3 (Temperature Relationships)	Engage - why can we not throw aerosol cans in the fire? Explore - Charles' Law (V-T) and Gay-Lussac's Law (P-T)	Explain - balloon volume vs. temperature - focus on graphing (linear relationships and absolute zero)	Evaluate - Ticket out the Door or similar daily formative assessment

		Elaborate - other temperature scales	
Lesson 4 (Combined Gas Law)	Engage - which laws apply? Explore - notes on Combined Gas Law	Explain - practice with Combined Gas Law Elaborate - graphing transformations (how can we linearize all the graphs?)	Evaluate - Ticket out the Door or similar daily formative assessment
Lesson 5 (Ideal Gas Law)	Engage - why does blowing a balloon inflate it? Explore - notes on the Ideal Gas Law and incorporating MOLES	Explain - particle diagrams with added moles + mixed law practice problems Elaborate - corrections to the ideal gas law (real gases)	Evaluate - Ticket out the Door or similar daily formative assessment Evaluate - Common Formative Assessment on all lessons
Resources (hyperlink to model lessons and/or resources): Discovery Education Science Techbook			

Reflection: Considering the planning, process and impact of the inquiry		
Prior to teaching the unit	During teaching	After teaching the unit