BPS Science Department Chemistry – Unit 6

Chemistry Unit 6 – Gas Laws

Unit Overview: In this unit, students will be able to use the combined gas law to determine the changes in properties of a gas when temperature, pressure, or volume of a gas are changed. The student will use Kinetic Molecular Theory (KMT) to identify real and ideal gasses. Students will describe the relationship between volume of gas and number of particles.

Essential Questions:

- How do the pressure, temperature, and volume of a gas affect each other?
- What is an ideal gas and how does it differ from a real gas?
- What is the Kinetic Molecular Theory (KMT)?
- How does one explain the properties of gasses using KMT?

MST Standard 4 - Science

Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

New York State Science Learning Standards Performance Expectations:

HS-PS 1-9 Analyze data to support the claim that the combined gas law describes the relationships among volume, pressure, and temperature for a sample of an ideal gas
HS-PS 1-6 Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
HS-PS 3-2 Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
HS-ETS 1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS 1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS 1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS 1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

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Time Frame	Skills, Practices, or Expectations	Specific Standards / Performance Indicators	Resources	Content Vocabulary	Measurement of Student Learning
11.28.2022 - 12.9.2022	**Gasses** Know and understand the Kinetic Molecular Theory (KMT). Explain properties of gasses using KMT. Understand the development of the combined gas law and apply the combined gas law to a variety of situations with differing temperatures, pressures, or volume. Compare and contrast ideal and real gasses. State the relationship between volume and number of particles of gasses under the same conditions. Understand the direction of heat flow and the relationship between and temperature.	**MST Standard 4 Science** **Key Idea 3** **3.4 -** Use Kinetic Molecular Theory (KMT) to explain rates of reactions and the relationships among temperature, pressure, and volume of a substance. **3.4a -** The concept of an ideal gas is a model to explain the behavior of gasses. A real gas is most like an ideal gas when the real gas is at low pressure and high temperature. **3.4b -** Kinetic Molecular Theory (KMT) for an idea gas states that all gas particles: ● Are in random, constant, straight-line motion. ● Are separated by great distances relative to their size; the volume of the gas particles is considered negligible. ● Have no attractive forces between them. ● Have collisions that may result in a transfer of energy between gas particles, but the total energy of the system remains constant. **3.4c -** Kinetic Molecular Theory describes the relationship of pressure, volume, temperature, velocity, and frequency and force of collisions among gas molecules. **3.4d -** Collision theory states that a reaction is most likely to occur if reactant particles collide with the proper energy and orientation. **3.4** – Equal volumes of gases at the same temperature and pressure contain an equal number of particles.	Castle Learning- Access through Clever BPS Science Department Recommended Virtual Labs – must be logged into BPS google document account through BPS Gmail account to access *Holt NY Chemistry* Textbook Chapter 12 Regents Chemistry Reference Tables - Table A,T Dynamic Periodic Table BPS Science K-12 Schoology Folder 9-12 Resources Chemistry Resources **PhET Interactives:** Gases Introduction ● Intro - Visualize effects of change in temp, pressure, number & type particle, volume ● Laws - Visualize effects of change in temp, pressure, # & type particle, volume; use a constant Gas Properties ● Ideal - Visualize effects of change in temp, pressure, number & type particle, volume; use a constant ● Explore - Same as ideal but no constants ● Energy - Observe changes in speed & KE due to temp, pressure, temp & number/type of particle ● Diffusion - Visualize diffusion as particles move Balloons & Buoyancy - Add gas particles; change volume & temperature and observe effects on pressure **Virtual PPTs:** ● STP - STP/ temperature conversion ● Gas Laws - Ideal gasses and gas laws	● absolute zero ● atmospheres ● barometer ● Boyle's Law ● Charles's Law ● Gay-Lussac's Law ● Ideal gas ● Kinetic Molecular Theory ● Pascal ● pressure ● real gas ● S.T.P.	● Ticket Out ● Think-Pair –Share ● Formative Assessment ● Weekly Quiz ● Unit Test ● Homework ● Review Questions ● DDI process using data from Edoctrina & Castle learning to generate data **Higher Level Question:** Regents Exam: January 2020 Questions 58-61

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			Molecular Workbench Gas laws and Weather Balloons – Interactive & simulations - Students can generate a report and print or share report **University of Texas** Gas Law Simulator – Simulation – Students can manipulate, pressure, volume and temperature		

Resources

http://ngss.nsta.org/Classroom-Resources.aspx - Searchable NYSSLS/NGSS aligned resources curated by NSTA
Buffalo Public Schools Science Department Chemistry Webpage – BPS chemistry curriculum resource hub
BPS Science Department Recommended Virtual Labs – Virtual lab resources with embedded links to virtual labs and student sheets. Must be logged into BPS google document account through BPS Gmail account to access.
NYS Regents Chemistry Exams 2012-2020 NYSED's Office of State Assessment webpage for released Regents Chemistry Examinations
NYS MST Science Learning Standards Physical Setting/Chemistry – Current NYS Physical Setting/Chemistry Standards
NYS P-12 Science Learning Standards (HS) – NYSSLS High School Standards
Regents Chemistry Reference Tables – Reference Tables for Regents Chemistry

ELL Enhancements To access hyperlinked material, you must be logged into your BPS Google Drive	**Listening** • **Cross- Linguistic Practices:** Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates.) • **Build background knowledge** • **Activating Prior Knowledge** Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content • **Activating Prior Knowledge** • **Visuals** - GIFs, pictures- will assist students in understanding what they are listening to. Use **visual thinking strategies** to set the lens for learning. • Video to review or introduce a topic – use **closed captioning** to help students see the words and pronunciations while they listen to the content.	**Speaking** • **Sentence Frames** - to begin a sentence - such as *Evolution is…* or *I think that evolution is…* • **Academic Conversation Starters:** Have a visual of a list of academic sentence starters that students can refer to in a discussion. Examples include- I expect ____ to happen. My data shows that… This helps students have a more science focused dialogue. • **Choral Reading** - To build fluency, self-confidence and motivation with reading/speaking • Create **movement** to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while	**Reading** • **Supplementary Text** to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension. • **Visual Aids** - Pictures or models to support vocabulary words and concepts • Video to review or introduce a topic - use **closed captioning** to help students read along while they listen to the content • **4 Square / Frayer models** to help students gain a deeper understanding of vocabulary. • **Highlighting** important text to assist students in answering questions after the reading. • **Chunking**-Break reading of text into chunks or paragraphs • **Vocabulary Morphology**- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by	**Writing** • **Sentence Frames** - to begin a sentence- such as *Biodiversity is…* or *An example of competition is….* • **Cloze passages** with word banks • **Word banks** • **Graphic Organizers** to help break down the writing process and organize thoughts • **Standards-based sentence stems** • **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from	**Instructional Accommodations (depending on the student's needs)** • **Extended time** for tests in class, projects and assignments • **Directions read.** Broken down as necessary • **Model** how to complete the activity in the lesson • **Oral simplification** of directions or questions • **Translated version** of test when available. Student may have both version English and native language version • Use of **approved bilingual glossaries** from NYS in each subject

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	• Word stretching / Vowel stretching when instructing allows student to listen closely to the pronunciation of the word • Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening Scroll for grades 9-12.	triggering brain function for optimal learning • Performance Level Descriptors This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking. Scroll for grades 9-12	meaning can be connected by spelling can be critical to expanding a student's vocabulary • Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of reading. Scroll for grades 9-12.	students based on earned NYSESLAT levels in the modality of writing. Scroll for grades 9-12.	
Special Education Modifications Special Education students must have accommodations as per Individual Educational Plan (IEP)	**Instructional** • **Pre-teach** vocabulary • Use **picture vocabulary** • Scaffold **Depth of Knowledge** questions • Provide copy of notes/**notes in "cloze"** form • Use of **Think, Pair, and Share** strategy to help process information • **Scaffold** written assignments with the use of **graphic organizers** • Allow for **multiple ways to respond** (verbal, written, response board) • Provide **model of performance task** • **Modify informational text** to fit the needs of the students • Provide a digital or paper i**nteractive notebook** • Present complex **tasks in multiple ways** • Provide **mnemonic strategies** for Chemistry concepts		**Technology:** • **Audio** reading of text • **Text to type** functions • **Videos** to clarify/visualize Chemistry concepts • **Record class lecture/discussions** and make accessible to student • **Nearpod**- interactive presentations of notes • **Playposit** - show a video clip about the topic and add your own questions for them to answer as they watch • Allow students to type answers in chat on **Teams** **Other:** • Arrange seating for maximum engagement and minimum distraction • Accessible lab space (counter level)		**In Class Assessments** • Provide **review packet or review sheet** of concepts covered on the test • Practice similar questions prior to the test • Provide **multiple options** for projects • Give a **timeline** of when things are due and remind them of the process often. • **Use of timer** in class • Break all complex tasks into chunks
Step Up to Writing Step Up to Writing materials can be found in BPS Science K-12 Schoology Folder 9-12 Resources Chemistry Resources Curriculum Materials	**SUTW Strategy** • Informal Outline • Color-Coding – Informative/Explanatory Text • Two-column notes • I-V-F Topic Sentence progressing to Four Step Summary Paragraph • CUPS – Capitalization, Usage, Punctuation, Spelling • Transitions				
Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom	Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications ● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population ● All students are given an opportunity to engage in science discourse ● Teacher demonstrates high expectations for all students CLRT resources which align to Science content are denoted with a *				