

BPS Science Department Chemistry – Unit 7

Chemistry Unit 7 – Physical Behavior of Matter (Part 2)

Unit Overview: The student will be able to interpret a heating or cooling curve and determine the heat gain or loss during a phase change or temperature change. The student will be able to determine the direction of heat flow in a system. The conditions necessary for a reaction to occur based on collision theory will be demonstrated and explained.

Essential Questions:

- What are the components of heating/cooling curves?
- What information can be obtained from heating/cooling curves?
- Who does the motion and orientation of particles affect their properties?

MST Standard 4 - Science

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

Key Idea 4: Energy exists in many forms and when these forms change energy is conserved.

New York State Science Learning Standards Performance Expectations:

HS-PS 1-3 Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS 2-6. Communicate scientific and technical information about why the particulate-level structure is important in the functioning of designed materials

HS-PS 1-5 Apply scientific principles and evidence to explain how the rate of a physical or chemical change is affected when conditions are varied.

HS-PS 3-1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

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-PS 3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-PS 3-4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

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
<p>12.12.2022 - 12.23.202</p> <p>12.26.22- 1.02.23 Winter Recess</p>	<p>Forms of Energy Describe the different forms of energy.</p> <p>Identify the forms of energy that can make physical and chemical changes.</p> <p>Heating and Cooling Curves Identify phases and their changes on a heating/cooling curve. Calculate the heat involved in a phase or temperature change. Interpret kinetic and potential energy on a heating/cooling curve.</p>	<p>MST Standard 4 Science Key Idea 3 3.1 - Explain the properties of matter in terms of the arrangement and properties of the atoms that compose them. 3.1jj – The structure and arrangement of particles and their interactions determine the physical state of a substance at a given temperature and pressure.</p> <p>Key Idea 4 4.1 – Observe and describe transmission of various forms of energy. 4.1a – Energy can exist in different forms, such as chemical, electrical, electromagnetic, thermal, mechanical, nuclear. 4.1b – Chemical and physical changes can be exothermic or endothermic. 4.2 – Explain heat in terms in kinetic molecular theory 4.2a – Heat is a transfer of energy (usually thermal energy) from a body of higher temperature to a body of lower temperature. Thermal energy is the energy associated with the random motion of atoms and molecules. 4.2b – Temperature is measurement of the average kinetic energy of the particles in a sample of material. Temperature is not a form of energy. 4.2c – The concepts of kinetic and potential energy can be used to explain physical processes that include: fusion (melting), solidification (freezing), vaporization (boiling, evaporation), condensation, sublimation, and deposition.</p>	<p>Castle Learning- Access through Clever</p> <p>BPS Science Department Recommended Virtual Labs – must be logged into BPS google document account through BPS Gmail account to access</p> <p><i>Holt NY Chemistry</i> Textbook Chapters 2, 11</p> <p>Regents Chemistry Reference Tables - Table B,T</p> <p>Dynamic Periodic Table</p> <p>BPS Science K-12 Schoology Folder 9-12 Resources Chemistry Resources</p> <p>PhET Interactives: States of Matter</p> <ul style="list-style-type: none"> • States - How particles of various substances move in solids, liquids, gases when heated/ cooled • Phase Changes - (click phase diagram on right) - When particles of various substances change phase due to temperature & pressure change • Interaction - View potential energy / forces between atoms in Ne & Ar <p>Energy Forms & Changes</p> <ul style="list-style-type: none"> • Intro - (click energy symbols) Visualize energy movement during heating & cooling; measure temperature • Systems - Observe how energy is converted from one form to another <p>Virtual PPTs:</p> <ul style="list-style-type: none"> • Phase Change - Phase changes/ phase change diagrams 	<ul style="list-style-type: none"> • boiling point • Boyle’s Law • calorie • calorimeter • condensation • deposition • endothermic • energy • evaporation • exothermic • freezing point • fusion • heat • heating/cooling curve • joule • kinetic energy • Law of Conservation of Energy • melting point • potential energy • Specific Heat Capacity • sublimation • temperature • vaporization 	<ul style="list-style-type: none"> • 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 <p>Higher Level Questions:</p> <p>Regents Exams: January 2020 Question 74 June 2018 Question 60, 62</p>

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			<p>CK12: Phase Change – Simulation - Explain why the temperature of a substance does not change during phase change; describe relationship between melting, freezing, condensation, evaporation, phase changes require energy to be added or removed; identify the direct relationship between energy and molecular motion</p> <p>Building Bridges Relationship between temperature and distance between particles, observe expansion of particles when heated</p> <p>Around the World- Interactive - observe relationship between atmospheric pressure, vapor pressure, and boiling point; define boiling point as point when vapor pressure equals atmospheric pressure; real world connections</p> <p>PBS Learning Media: Matter's Physical Properties - Interactive Tutorial - Includes vocab videos, students take notes, videos, check for understanding, can share link to work Boiling and Melting of Water – Simulation – Demonstrates movement of molecules</p> <p>Molecular Workbench: Intermolecular attractions and boiling point – Interactive - Includes questions, students can generate a report and print or share</p>		
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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

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<p>ELL Enhancements To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p>Listening</p> <ul style="list-style-type: none"> ● 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. ● 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. 	<p>Speaking</p> <ul style="list-style-type: none"> ● Sentence Frames - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i> ● 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 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 	<p>Reading</p> <ul style="list-style-type: none"> ● 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 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. 	<p>Writing</p> <ul style="list-style-type: none"> ● Sentence Frames - to begin a sentence- such as <i>Biodiversity is...</i> or <i>An example of competition is....</i> ● 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 students based on earned NYSESLAT levels in the modality of writing. Scroll for grades 9-12. 	<p>Instructional Accommodations (depending on the student's needs)</p> <ul style="list-style-type: none"> ● 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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<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p><u>Instructional</u></p> <ul style="list-style-type: none"> ● 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 interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for Chemistry concepts 	<p><u>Technology:</u></p> <ul style="list-style-type: none"> ● 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 <p><u>Other:</u></p> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level) 	<p><u>In Class Assessments</u></p> <ul style="list-style-type: none"> ● 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
<p>Step Up to Writing</p> <p>Step Up to Writing materials can be found in BPS Science K-12 Schoology Folder 9-12</p> <p>Resources Chemistry Resources Curriculum Materials</p>	<p><u>SUTW Strategy</u></p> <ul style="list-style-type: none"> ● 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 		
<p>Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom</p>	<p>Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications</p> <ul style="list-style-type: none"> ● 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 <p>CLRT resources which align to Science content are denoted with a *</p>		