

BPS Science Department Chemistry – Unit 3

Chemistry Unit 3 – Atomic Concepts

Unit Overview: In this unit, students will learn the history of Chemistry, including the development of the current atomic model. Students will learn about the structure of the atom and subatomic particles. They will be able to make a Bohr diagram and a Lewis electron dot diagram to represent an atom. Students will learn about the excited state of electrons and the corresponding emission spectrum.

Essential Questions:

- What is the notation for an atom?
- How did the modern model of the atom evolve?
- What are the major components of an atom and what are their locations?
- What is an isotope?
- How are valence electrons represented in the electron configuration and in a Bohr diagram?
- What is an emission spectrum and why is an emission spectrum important?

MST Standard 4 - Science

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

MST Standard 1 – Science

Key Idea 1: The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

New York State Science Learning Standards Performance Expectations:

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 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 3-5 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

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Time Frame	Skills, Practices or Expectations	Specific Standards / Performance Indicators	Resources	Content Vocabulary	Measurement of Student Learning
<p>10.10.2022 - 10.21.2022</p> <p>10.10.2022 Indigenous Peoples' / Italian Heritage Day</p>	<p>Element Names and Symbols</p> <p>Write notations for elements, including atomic number and mass number.</p> <p>Interpret the electron configuration given on the periodic table with the number of electrons in each shell and valence electrons.</p> <p>History of Chemistry</p> <p>Explore the historical developments of chemistry from Ancient Greeks through the modern atomic model.</p> <p>Models of Atoms/Atomic Structure</p> <p>Compare and contrast models of atoms and describe limitations of models.</p> <p>Determine the number of protons, neutrons, and electrons in an atom.</p> <p>Calculate the average atomic mass of an element.</p> <p>Determine the number of valence electrons of an element.</p> <p>Draw a Lewis Structure (electron dot diagram).</p> <p>Understand isotopes of atoms and differences between atomic mass and mass number</p> <p>Understand how and why an emissions spectrum is generated.</p>	<p>MST Standard 4 Science Key Idea 3</p> <p>3.1 - Explain the properties of matter in terms of the arrangement and properties of the atoms that compose them.</p> <p>3.1a - The modern model of the atom has evolved over a long period of time through the work of many scientists.</p> <p>3.1b - Each atom has a nucleus, with an overall positive charge, surrounded by negatively charged electrons.</p> <p>3.1c - Subatomic particles contained in the nucleus include protons and neutrons.</p> <p>3.1d - The proton is positively charged, and the neutron has no charge. The electron is negatively charged.</p> <p>3.1e - Protons and electrons have equal but opposite charges. The number of protons equals the number of electrons in an atom.</p> <p>3.1f - The mass of each proton and each neutron is approximately equal to one atomic mass unit. An electron is much less massive than a proton or a neutron.</p> <p>3.1g - The number of protons in an atom (atomic number) identifies the element. The sum of the protons and neutrons in an atom (mass number) identifies the isotope.</p> <p>3.1h - In the wave-mechanical model (electron cloud model) the electrons are in orbitals, which are defined as the regions of the most probable electron location (ground state).</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 Chapter 3</p> <p>Regents Chemistry Reference Tables</p> <p>Dynamic Periodic Table</p> <p>BPS Science K-12 Schoology Folder 9-12 Resources Chemistry Resources</p> <p>PhET Interactives:</p> <p>Build an Atom</p> <ul style="list-style-type: none"> • Atom - (click net charge & mass number on right) Add protons, neutrons, electrons to change element, mass, charge, stability • Symbol - Add protons, neutrons, electrons to view element symbol/ notation • Game - 4 Versions (find element on PT; identify charge & numbers) <p>Isotopes & Atomic Mass</p> <ul style="list-style-type: none"> • Isotopes - (click symbol & abundance # on right) Add neutrons to elements to see mass # & AMU plus symbols & abundance • Mixtures - View natural abundance visually for a variety of elements; see % composition and effect on AMU <p>Rutherford Scattering</p> <ul style="list-style-type: none"> • Rutherford Atom - Visualize how alpha particles interact with atoms of varying size • Plum Pudding Atom - Visualize how alpha particles interact with this atomic model 	<ul style="list-style-type: none"> • atom • electron • emission spectrum • excited state • ground state • isotope • mass number • nucleon • neutron • proton • valence electron 	<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: June 2019 Question 62 January 2019 Questions 51-53</p>

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		<p>3.1i - Each electron in an atom has its own distinct amount of energy.</p> <p>3.1j - When an electron in an atom gains a specific amount of energy, the electron is at a higher energy state (excited state).</p> <p>3.1k - When an electron returns from a higher energy state to a lower energy state, a specific amount of energy is emitted. This emitted energy can be used to identify an element.</p> <p>3.1l - The outermost electrons in an atom are called valence electrons. In general, the number of valence electrons affects the chemical properties of an element.</p> <p>3.1m - Atoms of an element that contain the same number of protons, but a different number of neutrons are called isotopes of that element.</p> <p>3.1n - The average atomic mass of an element is the weighted average of the masses of its naturally occurring isotopes.</p>	<p>Virtual PPTs:</p> <ul style="list-style-type: none">● Atomic Structure - Atomic theory, subatomic particles, atomic number, mass number, isotopes, atomic mass● Electrons & Light - Electron waves/ particles, electromagnetic spectrum, flame tests● Electrons - Orbitals, Bohr, energy levels, electron configuration <p>CK12:</p> <ul style="list-style-type: none">● Gold Foil Experiment – Interactive - Create and test a hypothesis; observe gold foil experiment; make claims● Atom Builder – Interactive – Build a Bohr model of atoms; locate subatomic particles in atom; distinguish atoms and ions; relationship between protons; neutrons and mass number; real world connections● Average Atomic Mass – Interactive - define isotope; calculate average atomic mass; real world connections● Neon Lights – Simulation - Distinguish ground vs. excited state; explain how the lines on the emission correlate to discrete change in energy levels; describe how electrons can emit visible light <p>Z Space Activities (code)</p> <p>Inside the Atom (A323) Identify the subatomic particles in the atom, analyze how changing the number of protons or neutrons affects the atom Teacher Resource pdf Student Resource pdf</p> <p>Electrons on the Move (A324) learn about elements and their electrons and how their electron arrangements determine where elements are located on the periodic table Teacher Resource pdf Student Resource pdf</p>		
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			Elements of the Periodic Table (A322) explore the periodic table, subatomic particles, valence electrons and isotopes Teacher Resource pdf Student Resource pdf	
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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

ELL Enhancements To access hyperlinked material, you must be logged into your BPS Google Drive	Listening <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. 	Speaking <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 	Reading <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 	Writing <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. 	Instructional Accommodations (depending on the student’s needs) <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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	<ul style="list-style-type: none"> ● 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>flow of fluent reading while triggering brain function for optimal learning</p> <ul style="list-style-type: none"> ● 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>that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary</p> <ul style="list-style-type: none"> ● 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>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p>Instructional</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>Technology:</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>Other:</p> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level) 		<p>In Class Assessments</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 Resources Chemistry Resources Curriculum Materials</p>	<p>SUTW Strategy</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 				

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Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom	<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>
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