Unit 01: Atomic Structure and Properties

Content Area:
Course(s):
Time Period: **Year**
Length: **180**
Status: **Published**

Unit 1

Unit Title:	Unit 1: Atomic Structure and Properties
Suggested Duration:	**2 weeks**

Interdisciplinary Connections

Interdisciplinary Connections
Reading and Writing Companion Standards for History, Social Studies, Science and Technical Subjects ▪ Grades 9-10 ▪ Grades 11-12 **Math Practices**: https://www.nj.gov/education/standards/math/Index.shtml **Science Practices**: https://www.nj.gov/education/standards/science/Index.shtml Find and paste appropriate Companion Standards or Practices here.

Mathematics—Metric conversions, solving for an unknown, interpreting graphs
Language Arts- Reading scientific documents for comprehension, writing conclusions, writing lab reports
Social Studies—Historical events leading to scientific discoveries and/or revisions
Foreign Language – Chemical nomenclature relates to the learning of any language

Technology Integration

Technology Integration
Northern supports the integration of the SAMR Model: a framework which extends learning through the use of technology. The installation of interactive boards, the purchase of softwares and subscriptions, and the investment in 1:1 laptops and various other instructional technologies are examples of Northern's

commitment to enhancing students' learning and preparing the 21st century learner for college and careers.

- *Use of Atomic Emission Spectroscopes*
- Vernier Computer-based probes and software
- ViewBoard for presentation of information and interactive activities
- United Streaming/Discovery Education
- Laptops/Computer Lab—web based project
- AP Classroom

Standard(s) Addressed

Course Skills

SPQ-1.A Calculate quantities of a substance or its relative number of particles using dimensional analysis and the mole concept.
SPQ-1.B Explain the quantitative relationship between the mass spectrum of an element and the masses of the element's isotopes.
SPQ-2.A Explain the quantitative relationship between the elemental composition by mass and the empirical formula of a pure substance.
SPQ-2.B Explain the quantitative relationship between the elemental composition by mass and the composition of substances in a mixture.
SAP-1.A Represent the electron configuration of an element or ions of an element using the Aufbau principle.
SAP-1.B Explain the relationship between the photoelectron spectrum of an atom or ion and: a. The electron configuration of the species. b. The interactions between the electrons and the nucleus.
SAP-2.A Explain the relationship between trends in atomic properties of elements and electronic structure and periodicity.
SAP-2.B Explain the relationship between trends in the reactivity of elements and periodicity

STAGE I Desired Results

STAGE I Desired Results
Objective (Transfer)
This first unit sets the foundation for the course by examining the atomic theory of matter, the fundamental premise of chemistry. Although atoms represent the foundational level of chemistry, observations of chemical properties are made on collections of atoms. Macroscopic systems involve such large numbers that they require moles as a unit of comparison. The periodic table provides information about each element's predictable periodicity as a function of the atomic number. The

electronic structure of an atom can be described by an electron configuration that provides a method for describing the distribution of electrons in an atom or ion. In subsequent units, students will apply their understanding of atomic structure to models and representations of chemical phenomena and explain changes and interactions of chemical substances.

Mastery	
Big Ideas/ Understandings *Students will understand that…* BIG IDEA 1: SCALE, PROPORTION, AND QUANTITY (SPQ) Quantities in chemistry are expressed at both the macroscopic and atomic scale. Explanations, predictions, and other forms of argumentation in chemistry require understanding the meaning of these quantities, and the relationship between quantities at the same scale and across scales. BIG IDEA 2: STRUCTURE AND PROPERTIES (SAP) Properties of substances observable at the macroscopic scale emerge from the structures of atoms and molecules and the interactions between them. Chemical reasoning moves in both directions across these scales. Properties are predicted from known aspects of the structures and interactions at the atomic scale. Observed properties are used to infer aspects of the structures and interactions.	Essential Questions Why are eggs sold as a dozen? How can the same element be used in nuclear fuel rods and fake diamonds?

Acquisition	
Students will know . . . See “essential knowledge” in each topic of College Board CED for Unit 1	*Students will be skilled at . . .* In Unit 1, students will practice identifying components of commonly used models and representations to illustrate chemical phenomena. They will construct models and representations and explain whether they are consistent with chemical theories. Students will also practice translating between data and various representations (e.g., photoelectron spectroscopy data and electron configurations). Students should then be able to use representations (e.g., PES graphs, electron

	configurations, periodic table, drawings) to explain atomic structure, which is the foundation for all subsequent units. Many of the most useful concepts in chemistry relate to patterns in the behavior of chemical systems, such as periodic trend in atomic and molecular properties. In this unit and all subsequent units, students should learn to analyze data presented graphically to identify patterns and relationships. Once a pattern is identified, s students should be able to examine evidence to determine if it supports the pattern or hypothesis pertaining to a testable question.

STAGE II Assessment Evidence

STAGE II Assessment Evidence	
Common Summative Assessments	Assessments
Tests Quizzes Laboratory Reports and analyses	Exit Slips Quizzes Homework Problems Participation in class discussions and in performance of lab experiments Laboratory notebook AP Classroom Unit checks
Modifications	
How are the evaluations/assessments modified/accelerated? (i.e.: alternate assessment). All courses follow a balanced assessment system with Practice, Assessments, Evaluations.	

Modifications on 504 plans may be submitted at (SSD). prior to testing. Both exclusion statements and extensions exist for each standard to accommodate different paces.

STAGE III Learning Plan

STAGE III Learning Plan

Organize plan by weeks

1.1 Moles and Molar Mass
1.2 Mass Spectroscopy of Elements
1.3 Elemental Composition of Pure Substances
1.4 Composition of Mixtures
1.5 Atomic Structure and Electron Configuration
1.6 Photoelectron Spectroscopy
1.7 Periodic Trends
1.8 Valence Electrons and Ionic Compounds

Modifications
How are the activities modified/differentiated? (i.e.: abridged text)

Modifications on 504 plans may be submitted at (SSD). prior to testing. Both exclusion statements and extensions exist for each standard to accommodate different paces.

Specific Resources for Unit

Specific Resources for Unit
Attached Affirmative Action Compliance Checklist

Selected College-Board practice problemsChang, Raymond and Goldsby, Kenneth A. Chemistry, 13th Edition. New York, McGraw-Hill. 2019
The College Board. AP Chemistry Guided Inquiry Experiments: Applying the Science Practices. 2013.
Demmin, Peter and David Hostage. AP Chemistry, Fifth Edition. New York: D&S Marketing Systems, Inc., 2005
Vonderbrink, Sally. Laboratory Experiments for Advanced Placement Chemistry. Batavia: Flinn Scientific, 2001.
POGIL Activities for High School Chemistry, Batavia: Flinn Scientific, 2012,
AP Classroom

Diversity, Equity, & Inclusion

Diversity, Equity &Inclusion
Provide a brief description of how this unit addresses DE&I.

Career Readiness (9.2), Life Literacies and Key Skills (9.4) Standards

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.2	Attend to financial well-being.
WRK.K-12.P.3	Consider the environmental, social and economic impacts of decisions.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.6	Model integrity, ethical leadership and effective management.
WRK.K-12.P.7	Plan education and career paths aligned to personal goals.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Climate Change Education

ClimateChange Education	
Enduring Understandings/Core Ideas	Performance Expectations
Math and ELA- Provide a brief description of a lesson or activity that relates to Climate Change. All other Content Team copy and paste the Core Idea and Performance Expectation from NJDOE link above.	