

Unit 02: Molecular and Ionic Compounds, Structure and Properties

Content Area:

Course(s):

Time Period: **Year**

Length: **180**

Status: **Published**

Unit 2

Unit Title:	Molecular and Ionic Compounds, Structure and Properties
Suggested Duration:	3-4 weeks

Interdisciplinary Connections

Interdisciplinary Connections
Reading and Writing Companion Standards for History, Social Studies, Science and Technical Subjects <ul style="list-style-type: none">▪ 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 <u>Companion Standards or Practices</u> 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

SAP-3.A Explain the relationship between the type of bonding and the properties of the elements participating in the bond.

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SAP-3.C Represent an ionic solid with a particulate model that is consistent with Coulomb's law and the properties of the constituent ions.

SAP-3.D Represent a metallic solid and/or alloy using a model to show essential characteristics of the structure and interactions present in the substance

SAP-4.A Represent a molecule with a Lewis diagram

SAP-4.B Represent a molecule with a Lewis diagram that accounts for resonance between equivalent structures or that uses formal charge to select between nonequivalent structures.

SAP-4.C Based on the relationship between Lewis diagrams, VSEPR theory, bond orders, and bond polarities:
a. Explain structural properties of molecules. b. Explain electron properties of molecules.

STAGE I Desired Results

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<i>Objective (Transfer)</i>
<p><i>In Unit 2, students apply their knowledge of atomic structure at the particulate level and connect it to the macroscopic properties of a substance. Both the chemical and physical properties of materials can be explained by the structure and arrangement of atoms, ions, or molecules and the forces between them. These forces, called chemical bonds, are distinct from typical intermolecular interactions. Electronegativity can be used to make predictions about the type of bonding present between two atoms. In subsequent units,</i></p>

students will use the periodic table and the atomic properties to predict the type of bonding present between two atoms based on position

Mastery

Big Ideas/ Understanding

Students will understand that...

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

How has the discovery of DNA changed the world?

How are molecular compounds arranged?

Acquisition

Students will know . . .

[See “essential knowledge” in each topic of College Board CED for Unit 2](#)

In this unit, students will learn how to...

Interpret simple graphical representations of changes in potential energy as two atoms approach each other to explain optimal bond length as well as why bonds may or may not occur. Students should also practice constructing representations and models for chemical phenomena (e.g., ionic and metallic solids) and using representations to make claims or predictions. For example, students can use VSEPR theory to draw Lewis structures of molecules and predict their three-dimensional geometry and polarity. Instead of simply connecting chemical theories to phenomena occurring at the atomic level, it is important to provide explanations across scales. For example, teachers can ask students to explain the connection between electronegativity and ionization energy with the type of bond formed and the macroscopic properties of a particular substance. Students should also work with several chemical concepts (Coulomb’s law, formal charge, and resonance) to evaluate the accuracy of a model in representing both the particulate-level structure and macroscopic observations. In future units, students will use the practice of constructing and understanding molecular representations to make predictions and claims about interparticle interactions, intermolecular forces, and their connections to macroscopic observations.

STAGE II Assessment Evidence

STAGE II Assessment Evidence	
Common Summative Assessments	Common Formative 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 2.1 Types of Chemical Bonds 2.2 Intramolecular Force and Potential Energy 2.3 Structure of Ionic Solids 2.4 Structure of Metals and Alloys 2.5 Lewis Diagrams 2.6 Resonance and Formal Charge

2.7 VSEPR and Bond Hybridization

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 problems

Chang, 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.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 <u>Core Idea and Performance Expectation</u> from NJDOE link above.	