Unit 07: Covalent Bonding

Content Area: **Science**
Course(s):
Time Period: **Marking Period 2**
Length: **2-3 Weeks**
Status: **Published**

Brief Summary of Unit

Students will learn how to draw Lewis Structures for molecules in this unit. Utilizing the VSEPR theory and Lewis Structures, students will be able to predict the geometry of a molecule. The polarity of a bond and molecule will also be discussed. A PhET simulation will allow students to explore the relationship between molecules and light and be able to predict what makes a gas a "greenhouse gas" and its effect on climate change.

Revised June 2022

Standards

HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
MA.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
PS2.B	Types of Interactions
MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
LA.K-12.NJSLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.K-12.NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
HS-PS1-3	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.

LA.K-12.NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
PS1.A	Structure and Properties of Matter
PS1.B	Chemical Reactions

Essential Questions

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Why do most atoms form chemical bonds?

How are ionic and covalent bonds formed and how does the bond type influence the properties of compounds?

Enduring Understandings

Atoms bond to attain the lowest possible potential energy.

The structure of the atom governs the types of bonds it can form.

Students Will Know/Students Will be Skilled At

Students will be skilled at drawing Lewis Structures for molecules and ions.

Students will know the exceptions to the octet rule and be able to draw molecules that exhibit these types of exceptions.

Students will know when a molecule exhibits resonance and how to represent it properly.

Students will be skilled at calculating formal charge and how it's used to determine the best arrangement of electrons in a Lewis structure.

Students will know how the VSEPR theory is used to predict the geometry of a molecule.

Students will know how and why bond angles are affected by lone pairs.

Students will know how to differentiate between a polar and nonpolar bond/molecule.

Students will know when a molecule will have a dipole moment.

Students will know how to determine the hybridization of a molecule.

Students will know how to determine the number of sigma and pi bonds in a molecule.

Students will know how the electronic structure of a molecule

Learning Plan

Preview the essential questions and connect to learning throughout the unit.

Review valence electrons.

Draw Lewis Structures and unitize the geometry and polarity of a molecule to predict its properties.

Model how to calculate formal charge.

Differentiate between atomic and hybrid orbitals.

Discuss the valence bond theory and molecular orbital theory to explain sigma and pi bonds.

Students will complete the PhET simulation on Molecules and Light to discover which properties of molecules are affected by the different types of EM radiation. They will then analyze current data on these greenhouse gases to infer how certain climates have been affected.

Labs/Activities:

The following PhET simulations can be utilized: Polarity & Dipole moments, Molecular Geometry, Molecules and Light.

Determination of Chemical Bonds Lab

Evidence/Performance Tasks

Formative

Completed Lewis Structures for molecules (including exceptions) and ions.

Identification of geometry and polarity of molecules.

Determining which structure is best using formal charge.

Self Assessment problems during class.

Completed problems in CHEMFILE: MINI GUIDE TO PROBLEM SOLVING HOLT 1999

Assigned homework problems in CHEMISTRY 11 ED. CHANG MCGRAW HILL 2013

Summative

Unit Quizzes and Tests

Benchmark

Midterm Exam

Alternative

Lab Report for Determination of Chemical Bonds Lab

Molecules & Light PhET - Predicting how the assigned molecule will be affected by the different types of light and if it will act as a "greenhouse gas."

Materials

CHEMISTRY 11 ED. CHANG MCGRAW HILL 2013

CHEMFILE: MINI GUIDE TO PROBLEM SOLVING HOLT 1999

Approved Textbook Link

In addition to general lab and safety equipment as noted in lab handouts:

aluminum shot

sodium chloride

sucrose

wax

Suggestions Strategies for Modifications

FOR SPECIAL EDUCATION STUDENTS , ELL, AT RISK AND STUDENTS GIFTED STUDENTS

https://docs.google.com/spreadsheets/d/1pQwsQoD_QLot65BTdHFEHN5dXIiqS54iQ5iDL8C4q6o/edit?

usp=sharing