01 Introduction to Organic Nomenclature & Structure

Content Area: **Science**
Course(s): **Organic Chemistry H**
Time Period: **Semester 1**
Length: **6 weeks**
Status: **Published**

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.
PS1.A	Structure and Properties of Matter
PS2.B	Types of Interactions
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.
PS1.B	Chemical Reactions
	Patterns
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.
	Planning and Carrying Out Investigations
	Stability and Change
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
	Structure and Function
	Developing and Using Models
	Constructing Explanations and Designing Solutions

Enduring Understandings

1. Understanding the structure and bonding of organic molecules is fundamental to being able to understand their properties and reactions.
2. Carbon is the main element in organic compounds; it is essential to life on Earth.
3. Carbon's ability to form stable bonds with many elements, including itself, allows carbon to form a huge variety of very large and complex molecules.
4. Organic molecules can be categorized by the presence of functional groups.
5. Organic molecules are systematically named according to IUPAC rules.
6. Organic molecules can be represented in multiple ways.

Essential Questions

1. How are organic molecules different from inorganic molecules?
2. How do organic chemists name and categorize organic molecules?
3. How do the chemical names and formulas of compounds relate to their physical and chemical behaviors?
4. How do organic chemists draw and depict molecules?

Knowledge and Skills

Knowledge: Students will...

1. Describe how the definition of an organic compound has changed since its origin in the 19th century.
2. Describe carbons' unique properties.
3. Identify modern sources of organic compounds and challenges the field faces in the 21st century.
4. Recognize the difference between compounds that are ionic vs. covalent and determine an appropriate formula.
5. State the importance of the octet rule as it relates to bonding.
6. Know the number of valence electrons for main-group elements.
7. Know the difference between structural, molecular, condensed and bond-line formulas.
8. Know the importance sigma and pi bonds play in the ability of atoms to rotate within a structure.
9. Understand the difference between constitutional isomers and stereoisomers.
10. Know the meaning of the terms eclipsed conformation, staggered conformation, anti-conformation, and gauche conformation.
11. Know the meaning of the terms angle strain, torsional strain, and van der Waals strain.
12. Understand how branching and molecular weight affects the boiling point of an alkane.
13. Know how distillation and cracking are important to steps of petroleum refining.
14. Summarize physical/chemical properties of hydrocarbons.

Skills: SWBAT…

1. Determine the number of protons, electrons, and neutrons for a given isotope.
2. Write the electron configuration for an atom or ion for any element between hydrogen and argon on the periodic table.

3. Determine the direction of polarization of a covalent bond based on the difference in electronegativity of the bonding atoms.
4. Draw Lewis structures to represent organic molecules and ions.
5. Calculate the formal charges on atoms in Lewis structures and bond-line drawings.
6. Determine the number of lone pairs and hydrogens present on atoms represented in Lewis structures and bond-line drawings.
7. Use VSEPR theory to predict the shape and bond angles within a molecule.
8. Identify sigma and pi bonds of an organic molecule.
9. Predict the hybridization of an atom in an organic molecule.
10. Draw models to visualize bonding overlap in molecules which display sigma and pi bonds.
11. Translate condensed structures to structural formulas and bond-line drawings.
12. Use the structural formula or bond-line drawing of a molecule to write the molecular formula.
13. Distinguish between saturated and unsaturated hydrocarbons.
14. Correctly identify and count the longest carbon chain in an organic molecule.
15. Draw the structures of alkanes and cycloalkanes using structural, condensed structural and bond-line formulas.
16. Accurately name alkanes and cycloalkanes by the systematic application of IUPAC rules.
17. Assign the appropriate prefix for a hydrocarbon name based on the number of carbons in the longest chain.
18. Identify and name common alkyl substituents.
19. Name and draw halogenated hydrocarbons (alkyl halides).
20. Draw structures for constitutionally isomeric alkanes.
21. Recognize and represent conformations of particular molecules by wedge-and-dash, Newman projection, and sawhorse formulas.
22. Given the chair conformation for a cyclohexane derivative, draw a structural formula for its ring-flipped form.
23. Balance combustion reactions of alkanes and cycloalkanes.
24. Rank alkanes according to boiling point and enthalpy of combustion.

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit?usp=sharing

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit