Board Approved October 2021

Wilson Area School District
Planned Course Guide

Title of planned course: Organic Chemistry

Subject Area: Chemistry

Grade Level: 11-12

Course Description: This course will provide students the basic skills and knowledge required for a college level first semester organic chemistry course. Organic Chemistry is an essential prerequisite for those entering the science, pre-medical, and pharmaceutical fields in college. The course would focus on topics including: nomenclature, atomic theory of orbitals and bonding, hybridization, analysis of isomerism in organic molecules, analysis of infrared spectroscopy to identify organic molecules, and the basic nucleophilic substitution and elimination reactions (SN_1, SN_2, E_1, E_2). It is highly recommended and expected that the student taking this course will have successfully completed a first year course in chemistry.

Time/Credit for this Course: Half Year / 0.5 Credits

Curriculum Writing Committee: Madison Pope, Michael Cavanaugh, Paul Stewart

Curriculum Map

August: Special Nature of Carbon

September: Molecular Orbitals and Hybridization Theory

October: Hydrocarbons: Alkanes, Alkenes, and Alkynes

November: Functional Groups: All of Them

December: Introduction to Organic Reactions/Mechanisms

January: Stereochemistry: Enantiomers, Diastereomers, and Meso Compounds

Wilson Area School District
Planned Course Materials

Course Title: Organic Chemistry

Supplemental Books:

- https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/intro1.htm
- https://unl.libguides.com/c.php?g=51744&p=334311

Teacher Resources:

- Wade, L. *Organic chemistry*; 8th ed.; Prentice Hall.
- Molecular Model Kits
- https://www.masterorganicchemistry.com/organic-1/#sn1sn2
- https://www.bbc.co.uk/education/topics/zx7mn39
- www.vimeo/com/channels/organicchemistry/page:4
- https://molview.org/
- https://joechem.io/content
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm

Curriculum Scope & Sequence

Planned Course: Organic Chemistry

Unit: Special Nature of Carbon

Time frame: 1 week

State Standards: 3.1.C.B6, 3.2.C.A1

Anchor(s) or adopted anchor: CHEM.B.1.2, CHEM.B.1.3, CHEM.A.2.1, CHEM.A.2.2, CHEM.A.1.1

Essential content/objectives: At end of the unit, students will be able to:
- Review the basic nature of bonding for elements.
- Differentiate between organic and inorganic compounds.
- Apply the historical facets of organic chemistry to the understanding of carbon-based systems as they are understood today.

Core Activities: Students will complete/participate in the following:
- Warm Up
- Guided Notes
- Problem Sets
- Review Sheets

Extensions:
- Students will take notes.
- Homework
- Teacher designed assignments.

Remediation:
- Students will have access to tutoring if they need it.
- http://ochem.com/
- https://joechem.io/content

Instructional Methods:
- Direct Instruction
- Demonstration
- Independent Practice

Materials & Resources:
- Notes
- Excerpts from textbooks
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- https://molview.org/

Assessments:
- Weekly - Biweekly Quizzes
- Problem Sets
- Online Quizizz

Curriculum Scope & Sequence

Planned Course: Organic Chemistry

Unit: Molecular Orbitals and Hybridization Theory

Time frame: 3 weeks

State Standards: 3.1.C.B6, 3.2.C.A1, 3.2.C.A2

Anchor(s) or adopted anchor: CHEM.B.1.2, CHEM.B.1.3, CHEM.A.2.1, CHEM.A.2.2, CHEM.A.1.1

Essential content/objectives: At end of the unit, students will be able to:
- Predict the hybridization and geometry of organic molecules based on their bonding.
- Predict and identify the steric number of organic molecules based on their lone pairs electrons and bonding.
- Draw Lewis Dot structures and determine the formal charge, the electron geometry, and molecular geometry of the molecule.
- Identify general classes of organic molecules based on their bonding (alkanes, alkenes, alkynes)

Core Activities: Students will complete/participate in the following:
- Warm Up
- Guided notes
- Problem Sets
- Molecular Model Construction

Extensions:
- Students will take notes.
- Homework
- Teacher designed assignments

Remediation:
- Students will have access to tutoring if they need it.
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Instructional Methods:
- Direct Instruction
- Demonstration
- Independent Practice
- Model Kits

Materials & Resources:
- Notes
- Excerpts from textbooks
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- https://molview.org/

Assessments:

- Weekly - Biweekly Quizzes
- Problem Sets
- Online Quizizz

Curriculum Scope & Sequence

Planned Course: Organic Chemistry

Unit: Hydrocarbons: Alkanes, Alkenes, Alkynes

Time frame: 5 weeks

State Standards: 3.1.C.B6, 3.2.C.A1

Anchor(s) or adopted anchor: CHEM.B.1.2, CHEM.B.1.3, CHEM.A.2.1, CHEM.A.2.2, CHEM.A.1.1

Essential content/objectives: At end of the unit, students will be able to:
- Draw and name the isomers of alkanes, and explain the trends in their physical properties.
- Draw alkane conformations, compare their energies, and predict the most stable conformations.
- Draw and name the isomers of cycloalkanes, and explain ring strain.
- Recognize structures that have stereoisomers, and identify relationships between stereoisomers.
- Recognize chiral structures, draw their mirror images, and identify features that may suggest chirality.
- Draw and name alkenes, cycloalkenes, and their derivatives.
- Show how alkenes can be synthesized by eliminations from alkyl halides and alcohols.
- Draw and name alkynes, cycloalkynes, and their derivatives.
- Discuss physical and chemical properties of hydrocarbons and how specific properties relate to bonding within molecules.

Core Activities: Students will complete/participate in the following:
- Warm Up
- Guided notes
- Problem Sets
- Review Sheets

Extensions:
- Students will take notes.
- Homework
- Teacher designed assignments

Remediation:
- Students will have access to tutoring if they need it.
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Instructional Methods:
- Direct Instruction
- Demonstration
- Independent Practice

Materials & Resources:

- Notes
- Excerpts from textbooks
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- https://molview.org/

Assessments:

- Weekly - Biweekly Quizzes
- Problem Sets
- Online Quizizz

Curriculum Scope & Sequence

Planned Course: Organic Chemistry

Unit: Functional Groups: All of Them

Time frame: 5 weeks

State Standards: 3.1.C.B6, 3.2.C.A1, 3.2.C.A2

Anchor(s) or adopted anchor: CHEM.B.1.2, CHEM.B.1.3, CHEM.A.2.1, CHEM.A.2.2, CHEM.A.1.1

Essential content/objectives: At end of the unit, students will be able to:
- Using the IUPAC nomenclature, systematically name organic molecules including alkyl halides, alcohols, ethers, esters, amides, amines, carboxylic acids, aldehydes, ketones.
- Identify functional groups in molecules based on their bonding.
- Attribute physical and chemical properties of organic molecules to their functional groups and structure.
- Determine how these organic molecules with functional groups contribute to real-life applications and uses.
- Analyze infrared spectroscopy data to identify different functional groups in organic molecules.

Core Activities: Students will complete/participate in the following:
- Warm Up
- Guided notes
- Review Sheets
- Problem Sets

Extensions:
- Students will take notes.
- Homework
- Teacher designed assignments

Remediation:
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Instructional Methods:
- Direct Instruction
- Demonstration
- Independent Practice

Materials & Resources:
- Notes
- Excerpts from textbooks
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- https://molview.org/

Assessments:

- Weekly - Biweekly Quizzes
- Problem Sets
- Online Quizizz

Curriculum Scope & Sequence

Planned Course: Organic Chemistry

Unit: Introduction to Organic Reactions/Mechanisms

Time frame: 2 weeks

State Standards: 3.1.C.B6, 3.2.C.A1

Anchor(s) or adopted anchor: CHEM.B.1.2, CHEM.B.1.3, CHEM.A.2.1, CHEM.A.2.2, CHEM.A.1.1

Essential content/objectives: At end of the unit, students will be able to:

- Propose mechanisms and explain the steps for simple reactions such as free-radical halogenation.
- Use the mechanism, thermodynamics, and kinetics of a reaction to predict which of several possible products is the major product.
- Name alkyl halides, explain their physical properties, and describe their common use.
- Predict the products of substitution and elimination reactions, and explain what factors favor each type of reaction.
- Identify the differences between first-order and second-order substitutions and eliminators.

Core Activities: Students will complete/participate in the following:

- Warm Up
- Guided notes
- Review Sheets
- Problem Sets

Extensions:

- Students will take notes.
- Homework
- Teacher designed assignments

Remediation:

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Instructional Methods:

- Direct Instruction
- Demonstration
- Independent Practice

Materials & Resources:

- Notes
- Excerpts from textbooks
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- https://molview.org/

Assessments:

- Weekly - Biweekly Quizzes
- Problem Sets
- Online Quizizz

Curriculum Scope & Sequence

Planned Course: Organic Chemistry

Unit: Stereochemistry

Time frame: 3 weeks

State Standards: 3.1.C.B6, 3.2.C.A1, 3.2.C.A2

Anchor(s) or adopted anchor: CHEM.B.1.2, CHEM.B.1.3, CHEM.A.2.1, CHEM.A.2.2, CHEM.A.1.1

Essential content/objectives: At end of the unit, students will be able to:
- Draw and determine the most to least stable stereoisomers
- Determine if the center carbons are chiral or achiral
- Indicate stereochemistry in various conformations of cyclohexanes
- Determine molecule's absolute configuration (R/S).
- Determine if stereoisomers give rise to enantiomers, diastereomers, or meso compounds based of their absolute configuration.
- Draw and analyze fischer-projections and newman projections of organic molecules.
- Predict the products of reactions of alkynes, including the orientation of the reaction (regiochemistry) and the stereochemistry.

Core Activities: Students will complete/participate in the following:
- Warm Up
- Guided notes
- Problem Sets
- Molecular Model Construction

Extensions:
- Students will take notes.
- Homework
- Teacher designed assignments

Remediation:
- Students will have access to tutoring if they need it.
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Instructional Methods:
- Direct Instruction
- Demonstration
- Independent Practice

Materials & Resources:
- Notes
- Excerpts from textbooks
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- https://molview.org/

Assessments:

- Weekly - Biweekly Quizzes
- Problem Sets
- Online Quizizz