



# Chemistry for Health Science - Unit 2 - Introduction to Organic Chemistry and Biochemistry

## Unit Focus

As students engage in a variety of hands-on laboratory experiments, they will be developing skills necessary for laboratory investigations in a chemistry course while also learning about the types of molecules that are essential for life. These skills and understandings will support students as they advance in this course and any future chemistry courses. Content emphasis will be on the structure of organic compounds, how different functional groups impact the properties of organic compounds, and types of macromolecules in the human body. To demonstrate their ability to apply their understanding from this unit, students will research the application of organic compounds to health science.

## Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer		
<p><b>Next Generation Science Standards</b> Performance Expectations: High School Physical Sciences</p> <ul style="list-style-type: none"> <li>Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. (HSPS2-6)</li> </ul> <p><b>Next Generation Science Standards (DCI)</b> Science: 11</p> <ul style="list-style-type: none"> <li>Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (PS2.9.B1)</li> </ul> <p><b>Madison Public Schools Profile of a Graduate</b></p> <ul style="list-style-type: none"> <li>Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1)</li> <li>Product Creation: Effectively use a medium to communicate important information. (POG.3.2)</li> </ul>	<p><i>Students will be able to independently use their learning to...</i></p> <p><b>T1</b> Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions. <b>T2</b> Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.</p>		
	Meaning		
	Understanding(s)	Essential Question(s)	
	<p><i>Students will understand that...</i></p> <p><b>U1</b> The organization of structural units in organic chemistry facilitates predictions about properties of families of compounds and their interactions in the body. <b>U2</b> Scientists use models to represent the structure of organic compounds. <b>U3</b> Chiral compounds are organic molecules often have one or more chiral centers where four different groups are attached to a carbon atom. Many pharmaceutical medications are chiral compounds. Many drugs currently in use are chiral compounds that contain equimolar mixture of two enantiomers. <b>U4</b> Carbohydrates, lipids, proteins, and nucleic acids are the four macromolecules essential for life's processes. <b>U5</b> An understanding of macromolecules and their 3D structure enables structure-based design of pharmaceuticals so that the pharmaceuticals complement receptor macromolecules in the body.</p>		<p><i>Students will keep considering...</i></p> <p><b>Q1</b> How does the structure of organic molecules influence their interaction in the body? <b>Q2</b> What are the different classes of organic compounds and how do they differ in structure and properties? <b>Q3</b> What are the important natural polymers in the human body and what are their functions?</p>
	Acquisition of Knowledge and Skill		
	Knowledge	Skill(s)	
<p><i>Students will know...</i></p> <p><b>K1</b> The functional group of an organic compound changes the properties of the hydrocarbon.</p>	<p><i>Students will be skilled at...</i></p> <p><b>S1</b> writing and modeling organic compounds and formulas.</p>		

## Stage 1: Desired Results - Key Understandings

**K2** Vocabulary: alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, alkyl halides, amines, ketones, aldehydes, carboxylic acids, esters, amides, carbohydrates, lipids, proteins

**K3** Identifying functional groups allows us to classify organic compounds according to their structure, to name compounds within each family, predict their chemical reactions, and draw the structures for their products.

**K4** Carbohydrates are made of carbon, hydrogen, and oxygen. They include sugars and starches. Carbohydrates are used to provide or store energy, among other uses.

**K5** Lipids are a class of macromolecules that are hydrophobic in nature. Major types include fats and oils, waxes, phospholipids, and steroids. Depending on their physical properties (encoded by their chemical structure), lipids can serve many functions in biological systems.

**K6** Proteins are macromolecules. They are constructed from one or more unbranched chains of amino acids; that is, they are polymers.

**S2** classifying types of organic compounds, based on functional groups.

**S3** Predict the products and write balanced chemical equations for the following types of organic chemical reactions:

- combustion of alkanes
- hydrogenation of alkenes
- combustion of alcohols
- esterification reaction

**S4** Describe the structure and function of carbohydrates, lipids, and proteins.

**S5** Explain how a pharmaceutical drug works based on its molecular structure.