

Sorting Organic Chemicals with Pseudocode		Grade 11 Chemistry
<h2>Lesson Plan</h2>	Coding Tool	Pseudocode
	Cross-curricular	N/A
<p><b>Big Ideas</b>  <b>B2.</b> Investigate physical and chemical properties of elements and compounds, and use various methods to visually represent them</p> <ul style="list-style-type: none"> <li>Grouping organic chemicals into families is an algorithmic activity, consisting of a sequence of IF, THEN/ELSE statements.</li> <li>Algorithms can be expressed as pseudocode</li> </ul>	<p><b>Specific Expectations</b>  <b>B2.2</b> use International Union of Pure and Applied Chemistry (IUPAC) nomenclature conventions to identify names, write chemical formulae, and create structural formulae for the different classes of organic compounds, including hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids, esters, ethers, amines, amides, and simple aromatic compounds</p>	
<p><b>Description</b>  Write pseudocode to identify an organic chemical based on its formula.</p>		
<p><b>Materials</b></p> <ul style="list-style-type: none"> <li>Pen &amp; paper or word processor</li> </ul>	<p><b>Computational Thinking Skills</b></p> <ul style="list-style-type: none"> <li>Pseudocode</li> </ul>	
<p><b>Introduction</b>  Organic chemicals are broken down into families based on their functional groupings (or lack thereof): the alkenes, alkynes, and alkanes, alcohols, <i>et cetera</i>. Keeping them straight can present a challenge, but telling them apart is a matter of applying the simple IF/THEN logic of a computer program.</p> <p>Algorithms can be expressed visually (as the traditional ‘tree of life’ diagrams) or as pseudocode. There are many ways of writing pseudocode that resemble different programming languages, but the point is to write something that has the structure of code, but is simpler and more abstract than the actual program.</p> <p>For example, here is a simple pseudo-program to classify the different pure hydrocarbon groups, along with alcohols:</p> <pre> IF (Compound's formula can be expressed as C<sub>n</sub>H<sub>n+2</sub>)     Compound is an alkane ELSE IF (Compound's formula can be expressed as C<sub>n</sub>H<sub>n</sub>)     Compound is an alkene ELSE IF (Compound's formula can be expressed as C<sub>n</sub>H<sub>n-2</sub>) </pre>		

<p>Compound is an alkyne  IF (Compound's formula can be expressed as <math>C_nH_{n+1}OH</math>)  Compound is an alcohol</p>
<p><b>Action</b>  Assign your students to attempt to write out instructions in pseudocode to classify organic chemicals.</p>
<p><b>Consolidation/Extension</b>  Extension:</p> <ul style="list-style-type: none"> <li>• If you did not cover all types of organic chemical classified by the IUPAC in class, challenge your students to expand their algorithm to include one or more extra grouping than you did not teach them.</li> <li>• If your class is very advanced at coding, you can let them try actualizing their pseudocode in scratch, python, or the environment of their choice (To make the problem more tractable, restrict them to the pure hydrocarbon groups for an actual program.</li> </ul>
<p><b>Assessment</b>  Assess students on the logic of their code, and its completeness—did they include all the groupings of organic chemicals covered in class? Were the rules correct?</p>
<p><b>Additional Resources</b>  Pseudocode:  <a href="https://computersciencementor.com/pseudocode/">https://computersciencementor.com/pseudocode/</a>  <a href="https://www.vikingcodeschool.com/software-engineering-basics/what-is-pseudo-coding">https://www.vikingcodeschool.com/software-engineering-basics/what-is-pseudo-coding</a>  <a href="https://www.code4example.com/pseudocode/pseudocode-examples">https://www.code4example.com/pseudocode/pseudocode-examples</a></p>