

# Chemistry - Organic: Unit 1 - Bond Line Drawings

| <b>Unit #:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACVSD-00067110                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Date(s)</b>                                                                                                                                                                                                                                                                                                                                 | 08-31-2018 to 10-02-2018 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Team:</b> Kristin Hurrelbrink (Author)<br><b>Grade(s):</b> 11, 12<br><b>Subject(s):</b> Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                |                          |
| <b>Unit Focus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                |                          |
| This unit is for learning how to "read" and understand bond-line drawings that are used in organic chemistry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                |                          |
| <b>Prior Learnings/Connection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                |                          |
| Students should have learned about covalent bonding, valence electrons, charges of ions, and how to draw Lewis Structures and read molecular formulas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                |                          |
| <b>Stage 1: Desired Results - Key Understandings</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                |                          |
| Standard(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Transfer                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                |                          |
| <b>Pennsylvania Assessment Anchors and Eligible Content</b><br><i>Chemistry: 12</i> <ul style="list-style-type: none"> <li>Predict characteristics of an atom or an ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity).<br/><i>CHEM.A.2.2.2</i></li> <li>Recognize and describe different types of models that can be used to illustrate the bonds that hold atoms together in a compound (e.g., computer models, ball-and-stick models, graphical models, solid-sphere models, structural formulas, skeletal formulas, Lewis dot structures).<br/><i>CHEM.B.1.4.1</i></li> <li>Utilize Lewis dot structures to predict the structure and bonding in simple</li> </ul> | <i>What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to...</i>                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Meaning</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Understanding(s)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Essential Question(s)</b>                                                                                                                                                                                                                                                                                                                   |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <i>What specifically do you want students to understand? What inferences should they make? Students will understand that...</i><br><br>U1 Students will understand that... <ul style="list-style-type: none"> <li>Organic chemists use a different system of drawing molecules called bond-line drawings</li> <li>Bond-line drawings focus on the carbon backbone of molecules because carbon only makes 4 bonds</li> <li>Bond-line drawings do not show</li> </ul> | <i>What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering...</i><br><br>Q1 <ul style="list-style-type: none"> <li>How can different models/structures be used to represent the same molecule?</li> <li>Why do organic chemists have their own way of drawing molecules?</li> </ul> |                          |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p>compounds. <i>CHEM.B.1.4.2</i></p> | <p>hydrogen attached to carbon molecules (but must show hydrogen atoms attached to atoms other than carbon)</p> <ul style="list-style-type: none"> <li>• Bond-line drawings are based off of the Lewis Structures of molecules</li> <li>• The carbon backbones are drawn using zig-zag lines where the end of each line represents a carbon atom, double bonds have an additional line between carbons and triple bonds have 3 lines between the carbon atoms</li> <li>• Triple bonds are drawn in a linear fashion due to the molecular geometry of the atoms</li> <li>• Bonds are usually drawn with the atoms as far apart as possible and may be drawn in any direction</li> <li>• Terms like "eliminated, added, or substituted" can be used to describe the changes taking place from one molecule to the other</li> <li>• Electrons can be found in two locations within an atom, either bonds or lone pairs</li> <li>• Neutral atoms are surrounded by the same number of electrons as we would predict for them as valence electrons from the periodic table</li> <li>• Atoms with a positive formal charge are surrounded by less electrons than their predicted number of electrons according to the periodic table</li> <li>• Atoms with a negative formal charge are surrounded by more electrons than their predicted number of electrons according to the periodic table</li> </ul> |  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

| Acquisition of Knowledge and Skill                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Knowledge                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  | Skill(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <i>What facts and basic concepts should students know and be able to recall? Students will know...</i><br><br>K1 During the unit the students will be able to define and use the following scientific terms: <ul style="list-style-type: none"> <li>• Bond-Line Drawing</li> <li>• Molecular Formula</li> <li>• Condensed (Structural) Formula</li> <li>• Lewis Dot Structure</li> <li>• Orbitals</li> <li>• Valence electrons</li> <li>• Lone pairs</li> <li>• Formal Charge</li> <li>• Positive Charge</li> <li>• Negative Charge</li> <li>• Molecular Geometry</li> <li>• Reaction terms:               <ul style="list-style-type: none"> <li>◦ added</li> <li>◦ eliminated</li> <li>◦ substituted</li> </ul> </li> </ul> |  | <i>What discrete skills and processes should students be able to use? Students will be skilled at...</i><br><br>S1 Students will be able to... <ul style="list-style-type: none"> <li>• Define what a bond-line structure is.</li> <li>• Read bond-line drawings by writing the molecular formula for them.</li> <li>• Draw bond-line drawings when given a Lewis Structure and/or a condensed structural formula.</li> <li>• Analyze a bond-line structure for the number of carbon and hydrogen atoms it contains.</li> <li>• Explain the changes taking place in a reaction when given the bond-line drawings of the reactants and products.</li> <li>• Explain how/why a formal charge is created.</li> <li>• Assign formal charges to atoms in molecules that are surrounded by a different number of electrons than would be predicted from the periodic table.</li> <li>• Determine how many (if any) lone pairs are present on various atoms, including atoms with charges.</li> </ul> |
| Stage 2: Assessment Evidence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Performance Task(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Alignment | Code | Assessment Evidence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | PT1  | <p><b>Untitled</b></p> <p><b>Performance Task</b></p> <p>Formative:</p> <ul style="list-style-type: none"> <li>• student note packet highlighting and practice problems</li> <li>• worksheet: organic chemistry w/ Klein #1</li> <li>• Worksheet: drawing formal charges #2</li> <li>• Practice with building organic molecules from kits and bond-line drawings</li> <li>• Lab - polyurethane hands</li> </ul> <p>Summative:</p> <ul style="list-style-type: none"> <li>• Quiz on sections 1-4</li> <li>• Chapter 1 test</li> <li>• Lab questions</li> </ul> |

### Stage 3: Learning Plan

| Alignment | Code | Learning Activities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | LA1  | <p><b>Untitled</b></p> <p><b>Learning Activity</b></p> <p>Day 1: Complete notes and practice for section 1.1 (how to read B-L drawings)</p> <p>Day 2: Complete notes and practice for section 1.2 (how to draw B-L drawings)</p> <p>Day 3: Molecule building - students will build the various complex molecules with the kits. They will have them checked as they complete them.</p> <p>Day 4: Complete notes and practice for section 1.3 (Mistakes to avoid) *additional class practice on the board with sections 1.1-1.3</p> <p>Day 5: Complete notes and practice for section 1.4 (More exercises) Students identify what has changed from one side of an equation to the other.</p> <p>Day 6: Molecule building - students will again build the various complex molecules with the kits. They will have them checked as they complete them.</p> <p>Day 7: Review and take quiz on sections 1.1- 1.4.</p> <p>Day 8: Go over quiz and begin section 1.5 (Identifying formal charges)</p> |

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | <p>Day 9: Continue with identifying formal charges.</p> <p>Day 10: Complete section 1.6 (finding lone pairs that are not drawn)</p> <p>Day 11: Students will complete the second set of practice problems (worksheet) that covers sections 1.5 and 1.6.</p> <p>Day 12: Videos discussing formal charges/lone pairs/bond line drawings from Crash Course Chemistry and/or Professor Dave Explains. Time permitting: additional group practice problems depending on what students need practice with.</p> <p>Day 13: Polyurethane Lab experiment and concept questions.</p> <p>Day 14: Review for all types of problems on the test. (go through and complete group practice problems of each type)</p> <p>Day 15: Chapter 1 Test.</p> |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Additional Information

### Resources

| RES  | RES                                                                                                                              | RES                                                                                                   |
|------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| RES1 | Organic Chemistry I: As a Second Language By: David R. Klein - This is the textbook we use for notes and many practice problems. |                                                                                                       |
| RES2 | Video - Professor Dave Explains - Lewis Structures                                                                               | <a href="https://www.youtube.com/watch?v=Sk7W2VgbhOg">https://www.youtube.com/watch?v=Sk7W2VgbhOg</a> |