A Sample System for Proficiency-Based Learning in the Classroom
Friday, March 27, 2015

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Google Site for this workshop:
https://sites.google.com/a/bsdvt.org/bhs-proficiency-resources/home

On this site, you can find links to:

• Molly's video about PBL in her chemistry classroom
• Additional sample materials from Molly's class and other science classes
• Amy's blog post about PBL in a physics classroom
• Materials developed by other teachers at Burlington High School who are experimenting with PBL in mathematics, humanities, world languages, and ELL classes

Our working list of Key Elements of Proficiency-Based Learning:

• Clear Learning Goals (Proficiencies)  
  Ideally, these include higher-order thinking and transferable skills, and are linked to school graduate expectations, CCSS, and 21st century skills
• Frequent Assessment for Feedback and Accountability
• Multiple Chances to Reach Proficiency
• Autonomy & Flexible Supports
• Every Student Expected to Reach the Goals
Proficiency 7F - I can determine the 3-D shape of small molecules using VSEPR.

Directions: For all questions except #1, determine the molecular geometry of each molecule listed below. For examples with just a formula, draw a Lewis structure first. If given a name, first write the formula then draw a Lewis structure.

1. What is VSEPR? How does it help explain the shape of small molecules?

2. CF₄  
   Molecular geometry: ____________________________

3. BrF₅  
   Molecular geometry: ____________________________

4. SeCl₆  
   Molecular geometry: ____________________________

5. CH₂O  
   Molecular geometry: ____________________________

6. H₂O  
   Lewis Structure:
   Molecular geometry: ____________________________

7. CO₂  
   Lewis Structure:
   Molecular geometry: ____________________________
8. CH₃Br  
   Lewis Structure:  
   Molecular geometry: _____________________________

9. nitrogen trichloride  
   Formula:  
   Lewis Structure:  
   Molecular geometry: _____________________________

10. sulfur dioxide  
    Formula:  
    Lewis Structure:  
    Molecular geometry: _____________________________

Prefixes:  
Mono 1  
Di  2  
Tri  3  
Tetra 4  
Penta 5  
Hexa 6  
Hepta 7  
Octa 8  
Nona 9  
Deca 10
### Unit 4: Electron Arrangement and Periodic Properties

#### Essential Questions
- □ How does an element’s placement on the periodic table help us predict its properties?
- □ How do we know how electrons are structured within atoms when they are far too small to see?
- □ How does the electron structure in an atom of an element affect that element’s properties?

#### Required Proficiencies

<table>
<thead>
<tr>
<th>4A</th>
<th>I understand the relative wavelengths, energies, and frequencies of the parts of the electromagnetic spectrum. I can describe the relationship between wavelength, frequency and energy of a wave.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preasses</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>New to Me</td>
<td>I Got This!</td>
</tr>
</tbody>
</table>

**Rate your own mastery of this proficiency. Remember that your rating can change over time.**

New to Me ➔ I Got This!

<table>
<thead>
<tr>
<th>4B</th>
<th>I can explain how atomic spectra relate to movements of electrons in atoms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate your own mastery of this proficiency. Remember that your rating can change over time.</td>
<td></td>
</tr>
<tr>
<td>New to Me ➔ I Got This!</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4C</th>
<th>I can describe electron configurations in atoms and have a basic understanding of the shape of atomic orbitals. (Will have orbital filling diagram to refer to, limited to s and p orbitals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate your own mastery of this proficiency. Remember that your rating can change over time.</td>
<td></td>
</tr>
<tr>
<td>New to Me ➔ I Got This!</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4D</th>
<th>I can use the periodic table to draw Lewis structures for single elements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate your own mastery of this proficiency. Remember that your rating can change over time.</td>
<td></td>
</tr>
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<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>4E</th>
<th>I can describe basic trends on the periodic table and use them to predict the properties of elements (reactivity, metal/nonmetal, atomic radius, valence electrons).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate your own mastery of this proficiency. Remember that your rating can change over time.</td>
<td></td>
</tr>
<tr>
<td>New to Me ➔ I Got This!</td>
<td></td>
</tr>
</tbody>
</table>

#### Vocabulary to Master

- □ wavelength
- □ electromagnetic spectrum
- □ ground state
- □ atomic radius
- □ frequency
- □ reactivity
- □ energy level
- □ Lewis structure
- □ metal
- □ periodic trend
- □ orbital
- □ valence electron
- □ nonmetal
- □ period
- □ photon
- □ electron configuration
- □ metalloid
- □ group
- □ alkali metals
- □ alkaline earth metals
- □ halogens
- □ transition metals
- □ noble gases
- □ hertz
- □ atomic spectrum
- □ excited state
<table>
<thead>
<tr>
<th>Extension Proficiencies</th>
<th>Quiz 1</th>
<th>Quiz 2</th>
<th>Quiz 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4F - I can calculate the energy, wavelength, or frequency of electromagnetic radiation. <em>(Extension of 4A)</em></td>
<td></td>
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</tbody>
</table>

*Rate your own mastery of this proficiency. Remember that your rating can change over time.*

New to Me ← I Got This!

| 4G - I can write electron configurations using only the periodic table (including noble gas short cuts and elements with d and f orbitals). *(Extension of 4C)* |        |        |        |

*Rate your own mastery of this proficiency. Remember that your rating can change over time.*

New to Me ← I Got This!

| 4H - I can describe periodic trends in electronegativity, ionization energy, and electron affinity. *(Extension of 4E)* |        |        |        |

*Rate your own mastery of this proficiency. Remember that your rating can change over time.*

New to Me ← I Got This!

| 4I - I can explain why periodic trends in atomic radius, ionization energy, and electronegativity occur. (For example, I can explain why atomic radius decreases as you move across a period.) *(Extension of 4E)* |        |        |        |

*Rate your own mastery of this proficiency. Remember that your rating can change over time.*

New to Me ← I Got This!

<table>
<thead>
<tr>
<th>Additional Vocabulary to Master</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ electronegativity</td>
<td>□ ionization energy</td>
<td>□ electron affinity</td>
<td>□ joules</td>
<td></td>
</tr>
</tbody>
</table>
UNIT 7: COVALENT COMPOUNDS

<table>
<thead>
<tr>
<th>Proficiency</th>
<th>Preassessment Score (%)</th>
<th>Practice Completed</th>
<th>Quiz Score (%)</th>
<th>Practice Completed</th>
<th>Quiz Retake Score(s) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7A</td>
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<tr>
<td>7B</td>
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<tr>
<td>7C</td>
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<tr>
<td>7D</td>
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<tr>
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<tr>
<td>7F</td>
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<tr>
<td>7G</td>
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</table>

I tutored ___________________________ on _______ and he/she scored 90% or higher on the quiz retake

I tutored ___________________________ on _______ and he/she scored 90% or higher on the quiz retake

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Teacher Initials

<table>
<thead>
<tr>
<th>Proficiency</th>
<th>Practice Completed</th>
<th>Quiz Score (%)</th>
<th>Practice Completed</th>
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</tr>
</thead>
<tbody>
<tr>
<td>7H</td>
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</tr>
<tr>
<td>7I</td>
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<tr>
<td>7J</td>
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<td></td>
</tr>
</tbody>
</table>
Proficiency Based Learning Cycle

Pre-assessment → Instruction/Practice → Proficiency Quiz

Less than 90% → Tutor
More than 90% → Extension Proficiency

Continue the cycle for all proficiencies in the unit

Post-Test:
Goal – All students score 90% or above
Unit 7– Covalent Compounds

Why?
Do a quick internet search for “dihydrogen monoxide” and you will see petitions to ban this hazardous chemical and fact sheets about its many dangers. You can read about how it is used as a performance enhancer for elite athletes, how it is used as a spray-on fire suppressant, and how it is a major ingredient in home-made bombs. You can also read about cities and towns that almost banned this dangerous chemical. Those bans did not go through in the end, however. Why not? Because as soon as someone with knowledge of basic chemistry hears about the push to ban dihydrogen monoxide, they start laughing. Can you figure out why? If you can’t yet, you will be able to after you complete this unit.

Required Proficiencies
7A - I can name and write formulas for covalent compounds.

7B – I understand how and why covalent bonds form.

7C – I can draw Lewis structures for molecules with single bonds.

7D - I can draw Lewis structures for molecules with double bonds or triple bonds and for polyatomic ions.

7E - I can calculate the molar mass of a compound.

7F - I can determine the 3-D shape of small molecules using VSEPR.

7G - I can determine a molecule’s polarity.

Extension Proficiencies

7H - I can name and write formulas for simple organic compounds (hydrocarbons).

7I - I can identify molecules that will display resonance and draw the possible resonance structures.  
*(complete after 7D)*

7J - I can predict substance properties based on intermolecular forces.  
*(complete after 7F and G)*