6. Describe your general findings for the physical properties of your known ionic compounds - state of matter, volatility, melting point, solubility, and conductivity. (If your results were not consistent, then indicate that in your findings.)

7. Describe your general findings for the physical properties of your known covalent compounds - state of matter, volatility, melting point, solubility, and conductivity. (If your results were not consistent, then indicate that in your findings.)

8. Using your data, which property is most consistent in categorizing a substance as ionic?
9. Using your data, which property is most consistent in categorizing a substance as covalent?
10. Is Unknown G ionic or covalent? Support your answer with at least 2 pieces of evidence from the lab.
11. Is Unknown H ionic or covalent? Support your answer with at least 2 pieces of evidence from the lab.
12. Is Unknown I ionic or covalent? Support your answer with at least 2 pieces of evidence from the lab.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Volatility (yes or no)</th>
<th>Phase at Room temp. (solid or liquid)</th>
<th>Melting Point (high or low)</th>
<th>Solubility: does it dissolve in water (yes or no)</th>
<th>Electrical Conductivity with water (yes or no)</th>
<th>Ionic or Covalent?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Distilled water: H₂O (control)</td>
<td>No</td>
<td>Liquid</td>
<td>Low</td>
<td>N/A</td>
<td>No-double check as control.</td>
<td>Covalent</td>
</tr>
<tr>
<td>B. CaCl₂</td>
<td>No</td>
<td>solid</td>
<td>high</td>
<td>yes</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>C. KCl</td>
<td>No</td>
<td>solid</td>
<td>high</td>
<td>yes</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>D. Sugar C₁₁H₂₂O₁₁</td>
<td>No</td>
<td>solid</td>
<td>low</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>E. Oil Test at Conductivity Station</td>
<td>Yes</td>
<td>liquid</td>
<td>Low</td>
<td>No</td>
<td>Test without water</td>
<td></td>
</tr>
<tr>
<td>F. Acetone Test at Conductivity Station</td>
<td>Yes</td>
<td>liquid</td>
<td>Low</td>
<td>Yes</td>
<td>Test without water</td>
<td></td>
</tr>
<tr>
<td>G. Unknown #1</td>
<td>No</td>
<td>solid</td>
<td>low</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>H. Unknown #2</td>
<td>No</td>
<td>solid</td>
<td>high</td>
<td>yes</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>I. Unknown #3</td>
<td>No</td>
<td>solid</td>
<td>low</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
</tbody>
</table>

Use the table to fill in the last column. Then, answer questions #1 - #12
Unit 3 Lab: Ionic or Covalent Bonding

Purpose: There are three types of bonds: ionic, covalent and metallic. The type of bond formed depends on how the elements involved follow the octet rule. Ionic compounds contain different ions, which are created when atoms exchange electrons to follow the octet rule. Covalent compounds are formed when elements share electrons. Metallic bonds are formed when atoms release valence electrons which then move around the newly formed cations. Properties such as state at room temperature, volatility (odor), melting point, solubility in water, brittleness, and electrical conductivity depend on the bond type. In this experiment you will find how these properties vary for ionic and covalently bonded substances.

Procedure: Part One

1. Using the wafting method, observe the smell of each substance in the stock beakers. If you can smell the substance, then write yes in the column under volatility. If you cannot smell the substance, then write no in the column under volatility.

2. In the data table record the phase at room temperature—solid or liquid, no gases tested.

3. Place a tiny amount of each substance (<1g) in the test tubes provided. Put one per well only!

4. Add several milliliters of distilled water into the wells with the solid sample. Do not put water into the liquid samples. Mix the samples so that each has a chance to dissolve in water. Rinse your stirring rod in between samples.

5. Determine which substance is soluble in water. The substance dissolves if the original substance is no longer visible. The water solution may have a color but should be transparent.

6. Clean up! Clean all materials and return equipment to the correct location.

7. Test each substance that dissolved for electrical conductivity using the large tester provided. Be sure to rinse your electrodes after each substance and dry with paper towel. Record your results in the data table. DON’T FORGET TO CHECK THE VOLATILITY OF THE LIQUIDS HERE!

Procedure: Part Two

Test Only Solid Substances

1. Make small foil boats by wrapping a piece of aluminum foil around your thumb. Your boats should be about the size of the end of your thumb.

2. Put a small amount of one solid (enough that you can see) into a small foil boat.

3. Place all the boats on the hot plate on medium-high. Heat for a maximum of 3 minutes. Record in the data table which substance melts, or in which nothing happens at all. Recheck for volatility.

Post-Lab Questions: Answer in full sentences on a separate sheet of paper and staple to your lab.

1. Ionic compounds must be composed of 2 ions, one cation and one anion. How are cations and anions formed and what types of elements form those ions?

2. How is a covalent bond different than an ionic bond?

3. What types of elements are involved in covalent bonds, and why does that explain how the covalent bond is formed?

4. Why are we using distilled water for our solubility test instead of tap water?

5. What does a high or low melting point tell us about the energy of the chemical bond tested? Include a comparison of ionic and covalent compounds in your answer.