Ionic Bonding Lab

**Introduction**: We have learned about ionic bonds, or the bond between a metal and a non-metal, in detail in this class, but there is something you may not know about them…they can conduct electricity! Electricity is defined as being a flow of electrons through a medium. However ionic compounds cannot conduct electricity at room temperature (about 70 oF); ionic compounds are solid at room temperature, which means that their electrons are not free to move.

Most solid ionic compounds, like sodium chloride, are arranged in very ordered, three-dimensional structures. These are referred to as crystals. The repeating patterns that are often seen in these crystals are referred to as crystalline lattice structures, providing potentially beautiful arrangements depending on the compound you are using. Shown below is an example of how sodium chloride is arranged:



As previously mentioned, this solid crystalline structure makes conductivity impossible, since the electrons are not free to move. When water is added however, these compounds are dissolved into their cations (positively charged ions) and anions (negatively charged ions), thus allowing conductivity to be possible.

**Purpose**: To understand that an ionic bond is between a metal and a non-metal. Additionally, when water is added to ionic compounds, they split into their ions.

**Hypothesis**: Which of following compounds do you think is ionic *(Circle the ones you think are ionic)*:

**Gatorade Lemonade Orange Juice Baking Soda (NaHCO3) Water Chalk (CaCO3)**

Why do you think so?

**Pre-Laboratory Questions** (look in the introduction for help, and please don’t copy the questions)

1. What is electricity?
2. Why can’t solid ionic compounds conduct electricity at room temperature?
3. How are the atoms of sodium chloride arranged? Describe why this structure inhibits conductivity.
4. How does water allow ionic compounds to conduct electricity?
5. What are cations? What are anions?

**Materials**:

 Test Materials Beakers Conductivity Probe Paper Towels Tissue

**Procedure**:

1. Keeping the light bulb dry, place the wires inside the beaker containing the substance.
2. When finished, dry the wires with a tissue/paper towel, making sure it is completely dry
3. Fill out the data table for the test material you are experimenting on.
4. When finished wait for instructions to move on to the next station.

**Data Table**:

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Material** | **Prediction****(will it light up?)** | **Result****[None, low, medium, high, very high]** | **Ionic or****Non-Ionic?** |
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**Post-Laboratory Questions**:

1. Which of the materials listed above conducted electricity? How do you know they conducted electricity?
2. Why did the salt (NaCl) not conduct electricity when there was no water to dissolve it (look in the introduction for the answer)?
3. Did the results of your experiment agree with your hypothesis? If not, how were they different?4
4. For the following questions, show the reactions between the two elements, and provide the name of the ionic compound that forms as a result:
	1. Sodium and chlorine
	2. Calcium and carbonate ion
	3. Copper (I) and sulfate ion
	4. Iron (III) and oxygen
	5. Aluminum and oxygen
5. The introduction describes sodium chloride (NaCl) as being arranged in a crystalline lattice structure. Draw a picture, showing this lattice structure, and additionally draw a picture showing what happens after water is added to the beaker.