PhET: Sugar and Salt Questions

**Instructions**

Google “phet sugar and salt.” Click the first link and download the PhET to your computer. Once downloaded, hold down “control” and click the icon in your downloads folder. This will give you the option to bypass the security controls and open the file without going through System Preferences.

**Macro**

1. The first tab, “Macro” will allow you to shake either salt or sugar into the water container. Click “Show values” to get concentration values to appear in the graph. Then, drag the conductivity meter on the right-hand side of the screen so that the two electrodes are dipped into the solution.
   1. What happens to the light bulb when the concentrations of each substance are zero?
   2. Shake some of the salt into the water to create a salt-water solution. What is the relationship between salt concentration and light-bulb brightness?
   3. Click “Remove salt,” and then switch the shaker from “Salt” to “Sugar.” Shake some of the sugar into the water to create a sugar-water solution. What is the relationship between sugar concentration and light-bulb brightness?

**Micro**

1. Click over to the second tab, “Micro.” The shaker present should be “Sodium Chloride.” If not, select this substance in the “Solute” box.
   1. Shake the sodium chloride into the water. Watch how the substance appears before entering the water and after it enters the water. Describe that change.
   2. Click “Remove solute” and switch the shaker over to “sucrose.” Shake the sucrose into the water and watch how the substance appears before entering the water and after it enters the water. Describe that change.
   3. Compare and contrast the dissolution of sodium chloride to the dissolution of sucrose at the Micro level. What are the similarities and what are the differences? Be sure to make reference to the bar graph at the right.
2. Click “Reset All.” There is an arrow pointing to the right next to the word “Solute” in the box. Click once to the right so the two substances are sodium chloride and calcium chloride.
   1. After shaking both substances into the water individually and describing the process, as you did in ‘2a’ and ‘2b’ previously, compare and contrast the dissolution of both substances at the Micro level. What are the similarities and what are the differences? Be sure to make reference to the bar graph at the right.
3. Click “Remove Solute.” Click the arrow to the right of “Solute” once to switch the compounds to sodium chloride and sodium nitrate.
   1. After shaking both substances into the water individually and describing the process, as you did in ‘2a’ and ‘2b’ previously, compare and contrast the dissolution of both substances at the Micro level. What are the similarities and what are the differences? Be sure to make reference to the bar graph at the right.
   2. Nitrate, NO3-, is known as a polyatomic ion. Based on your observations in this activity and your prior knowledge, how would you describe the various bonding that occurs in a salt that contains a polyatomic ion?

**Argument**

1. Address the following question: How do ionic compounds and molecular compounds behave differently in solution?
   1. Write a claim statement answering this question.
   2. Provide 3 pieces of evidence derived from your answers to the questions in the Macro and Micro sections above.
   3. Justify your evidence to support your claim. Use the following terms and concepts:
      1. conductivity, ions, polarity, hydrogen-bonding, dissociate, dissolve