Visualizing Mixing with *Sugar and Salt Solutions* PhET simulation

Learning Objectives:

* Describe the process of solution formation for salts versus molecular compounds.
* Identify the differences in an ionic solution and a molecular solution

**Directions:**

Open the *Sugar and Salt Solutions* simulation at <http://phet.colorado.edu>

1. Move the conductivity tester to the solution.
2. Shake some salt into the water.
   * Does the conductivity tester light up?
   * What kind of substance causes the conductivity tester to light?
3. Click on the “remove salt” button.
4. Change the solute to sugar and shake some into the water.
5. Test the solution again with the conductivity tester.
   * Did it light up?
   * What type of substance is this?
6. Click on the “Micro” tab at the top of the page.
7. Select the sodium chloride solute.
8. Shake some salt into the water.
   * What happens to the salt as it mixes with the water?
9. Look at the Concentration graphic.
   * How do the concentrations of the 2 ions compare?
   * How would the concentrations of the cation and anion compare if the salt had been CaCl2 ?

1. Now move the evaporation slider to the right and hold until all the water has evaporated.
   * What do you observe?
   * Is the substance, NaCl, different than when it was first added to the water?
2. Add water and move the evaporation slider again, this time take notice of the ion concentrations as you do so.
   * What happens to the ion concentrations as the water evaporates?
3. Click the reset button at the bottom.
4. Select the solute glucose.
5. Add the sugar to the water
   * What do you observe?
   * How does process of solvation for sugar differ from that of salt?
   * Which solution results in a greater number of particles in solution- salt or sugar?
6. Use the slider at the bottom to evaporate the water.
   * What did you observe? How is the formation of sugar crystals different from the formation of salt crystals?
7. Now, click on the “Water” tab at the top.
   * What do the RED spheres represent?
   * What do the WHITE spheres represent?
   * Is the molecule symmetrical?
   * Does it have a dipole moment?
   * Is it polar or nonpolar?
8. Click and drag a sodium chloride crystal into the water. Immediately click the “pause” button in the lower left.
9. Notice that the water molecules surround the ions. This process is called ***hydration.***
   * Which end of the water molecules seem to face the Na+ ion- the red end or the white end?
   * Is this end more positive or more negative?
   * Which end of the water molecules seems to face the Cl- ion?
   * Is this end more positive or more negative?
10. Click the reset button.
11. Repeat the process for glucose.
    * Does the sugar molecule break up?
    * Do the water molecules orient themselves in any particular way?
12. Click on the “Sugar in 3D” button.
    * Is the sugar molecule symmetrical?
    * Does it have a dipole moment?
    * Is it polar or nonpolar?