

Lesson plan for *Sugar and Salts*:

<http://phet.colorado.edu>

Learning Goals: Students will be able to:

- Identify if a compound is a salt or sugar by macroscopic observations or microscopic representations.
- Explain how using combinations of solutes changes solution characteristics or not.
- Use observations to explain ways concentration of a solute can change.
- Describe ways the formula, macroscopic observations, or microscopic representations of a compound indicates if the bonding is ionic or covalent.

Background:

Most of the college prep chemistry students will have experience with molecular representations of moving particles in physics, but not all of the students took physics. In honors chemistry, students will have used molecular representations in their text book, physics and chemistry lessons using PhET. In regular chemistry, during a lab about salts, I put out some sugar, salt, and acid solutions and provided a conductivity tester. The honors students should have experience with conductivity from physics. At this point in the course, we will not have talked about anhydrides, so the students would not predict molecular compounds like CO₂ to conduct in water. I have avoided the issue in the clicker questions.

***Sugar and Salt* Introduction:**

Students may have difficulty with the scale of the Micro tab since the water is not depicted. The number of water particles is really quite small, so the representation is an over simplification of the actual hydration process. The third tab is meant to help with this, but there is no way to exclude the water particles, so during the post-lab or during class, I plan to demonstrate that the third tab is a “super microscopic” version of the second tab. [Tips for Teachers](#) are provided by the PhET team.

Lesson: In college prep chemistry, the students will work in pairs during class. I noticed that students did not realize that there were 5 different solutes and many only were answering the questions for “salt” and “sugar”; I began checking groups and guiding them to use the other salt and sugars. I changed the directions to include the number of chemicals available hoping this helps. My honors chemistry students will do this activity for homework because they have already had an introduction to molecular representations of solutes using Salts and Solubility [Activity 1](#).

Post-Lesson: I plan to use clicker questions included in this activity. For some of the questions, if I saw that the distribution of answers was great, I demonstrated the sim to help students after the first clicker response before I made any comments. Then I would have a “revote”. This stimulated lots of discussion between votes.

I included an alcohol in the lab and it seemed that most students made appropriate predictions because “it was made up of the same elements as sugar that it would not dissociate”. I included a clicker question to help them see the difference between acids and alcohols because my texts both integrate acids and alcohols early in the sequence, but just as classification introduction, not function. I also specifically included aluminum because some students think it is a metalloid; the texts both mention this irregularity on the periodic table, so I wanted to reinforce the metal nature of Al. Having HCl in the questions also provides an opportunity to remind students that Hydrogen is not a metal even though it is on the metal side of the periodic table in the versions that they use.

Following Activities: Real lab with Salt and sugar (see activity for file) and Molarity: Quantitative Relationship’s.