

Lesson plan for *Molarity: Quantitative Relationships*

<http://phet.colorado.edu>

Time for activity

Learning Goals: Students will be able to

- A. Determine the solubility for some solutes and explain why the solubility cannot be determined for others given experimental constraints.
- B. Identify the relationships for measurable variables by designing quantitative experiments, collecting data, graphing, and using appropriate trend lines.

Background: My students will have used [Salts and Solutions](#) and [Sugar and Salts](#), so they are familiar with macroscopic and microscopic views of solutions. Additionally, we have used many PhET sims like [States of Matter](#) and [Gas Properties](#). In our Gas Laws unit, I discovered that the students needed more practice selecting appropriate curves for fit. We use Excel and TI graphing calculators pervasively in our school, so I was surprised that the seniors were poor at selecting appropriate curves when data had reasonable variations. So I had them do a lab with sugar and salts (file attached in this activity). We had more discussion about curve choice and then did this activity.

***Molarity* Introduction:**

I did not show anything about the sim. The [Tips](#) have good information about the assumptions made in this sim.

Lesson:

The students took about 2 -40 minute periods to complete this activity.

Post-Lesson: I have not written any clicker questions. We did a lab I wrote called Molarity and Dilution. I chose the nickel salt because I had a large supply and it has a nice color. I did not worry that it might not totally dissolve, but just wanted to make sure it was colored and that dilution would look very different. You could use any number of chemical and perhaps one that is more soluble. My jar was full and had not been used in 15 years, so it seemed a good use. We have chemical traps, so I don't have to worry about disposal.

Sample unit plans – **Homogenous Solutions**

Day 1 [Sugar and Salts PhET](#)

Homework: textbook reading

Day 2 Lecture – Polar vs non-polar solvents sample text concept questions

Lab: Solubility of salt and sugar

Homework: textbook reading and problems

Day 3 [PhET Molarity](#)

Day 4 Lecture- , Concentrations of solutions calculations- molarity and dilutions, Percent solutions

Lab: Small scale molarity lab

Homework: textbook reading and problems

Day 5 Lab: Solubility of salt and sugar class time to write with computers

Day 6 Review worksheet, clicker questions Sugar and Salts PhET

Day 7 TEST