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Chem 503
Dr. Roberts
CONTENT INTEGRATION PROJECT

Topic: Molecular Geometry and Modeling

Background

The School District of Philadelphia Core Curriculum for Chemistry does not address the topic of molecular geometry at all, let alone the topic molecular modeling. While the topic of molecular geometry, by itself, might not be considered advanced content, molecular modeling is, and an understanding of the former helps to support an understanding of the latter. Therefore, I will be teaching a unit that combines molecular geometry with energy. Since there is no particularly "good" spot in the Core Curriculum to place this unit, I will be attempting to place it before the required unit on intermolecular forces.

Student Population

The students that I teach are, almost across the board, struggling readers with basic or below-basic math skills. Approximately two-thirds of the students are "repeating 10^{th} graders" in an 11^{th} grade class, meaning that they failed enough classes that they are still considered, credit-wise, 10^{th} graders, while still being required to take 11^{th} grade classes. Several of the remaining third are seniors that have already failed chemistry once, and need to pass the class in order to graduate. Because of the almost universal low level of math skill in the class, I have chosen a topic that does not rely upon a great deal of math for basic understanding.

Activities

- Introduction to VSEPR and VSEPR POGIL – I will give a brief overview, with a connection to what they have already learned about Lewis Dot Structures. The students will then complete a POGIL in groups of four. Groups will share out answers, with discussion.
- Molecular Modeling with Balloons – Students will create models of molecules using pear-shaped balloons and string.
- CHIME computer MM tutorial (http://www.nyu.edu/pages/mathmol/chime/) – Students will complete an online tutorial that shows them different ways of depicting molecules, and the reasons why we use different methods.
- Introduction to Chemical Potential Energy – Students will be refreshed on the concept of mechanical potential energy, and be introduced to its connection with chemical potential energy.
- Introduction to Stretch, Bend, Torsion and Van der Waals – Students will be introduced to these concepts while looking at springs.
- Demonstrating Steric Effects with Chem3D – I will show various molecules in various formations using Chem3D projected onto a screen.

Schedule

Day One: Introduction to VSEPR and VSEPR POGIL
Day Two: Review VSEPR POGIL and Balloon Activity
Day Three: (In computer lab) Review knowledge from Balloon Activity, complete CHIME tutorial
Day Four: Remainder of unit

Objective

My hope is that placing this mini-unit before the required unit on intermolecular forces will help them to visualize some of the reasons for, and effects of differences in intermolecular bonding. Since many of my students are highly visual learners, putting them in the computer lab, and also showing them interactions using Chem3D should help them to better grasp the concepts. I would also like to have the students work with MathMol, an online Molecular Modeling "Textbook" by the same people who put together the CHIME tutorial, but as of the last time I checked, it was not working properly.