

ARISE Curriculum Coordination to Science of Atoms and Molecules (SAM) Project

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This document is laid out by SAM activity. For each activity, there is a list of labs, demonstrations, articles, and/or worksheets that will help support it. Usually, it is assumed that these supplementary materials will help students prepare for the SAM activity, so as to get the most from it. It is not expected that teachers will use all of the materials cited; rather, the compilers have tried to convey the wealth of material available in the *ARISE Instructional Materials Guide, Part 1: Physics* and *Part 2: Chemistry* that supports the SAM activities.

SAM Activity: Chemical Bonds

SAM Theme Activities, Day 1:

The first day of the SAM module on chemical bonding introduces students to the notion that an electron orbital is a region of probability, and that this region can be distorted by the presence of an external electric field—perhaps provided by the presence of another atom. The module itself provides some nice models for the necessary concepts of electrostatics (which recur throughout the SAM materials). A concurrent discussion of the concepts of molecular orbitals (pi and sigma bonds) may prove fruitful in some classes.

With Day 1:

[ARISE Physics Topic 9: Electric Forces](#) (pdf)

Electric Force Worksheet, *ARISE Instructional Materials Guide, Part 1 - Physics*

Labs:

- Hewitt Lab 86, “Static Cling.” The student uses an electroscope to explore various aspects of positive and negative charge.
- Hsu Lab 15A, “Observing Electric Charge.” A homemade electroscope is used to observe the properties of electric charge.
- “Conceptual Coulomb’s Law.” The force between a pith ball and a charged plate is compared for a charge Q , a charge of $Q/2$ and a charge of $Q/4$ placed on the pith ball (constant charge on the plate).

SAM Theme Activities, Day 2:

The Day 2 module of the SAM materials on chemical bonds explores the continuum of bond types that are determined by electronegativity difference. Prior to completing this module, the student should explore the differences in physical and chemical properties between ionic and molecular substances. Given

some background in those differences, the SAM explorations can go a long way to help the student understand why those differences exist.

With Day 2:

[ARISE Chemistry Topic 15: Ionic and Metallic Bonds](#) (pdf)

Electric Force Worksheet, *ARISE Instructional Materials Guide, Part 1 - Physics*

Labs:

- *Flinn ChemTopic Labs*, Vol. 12, "It's in Their Nature." Students study the solubility patterns of ionic, polar, and nonpolar compounds in a variety of solvents to understand the types of intermolecular attractive forces that exist.

Articles:

- *ChemMatters*, February 1988, pp. 4–8, "Artificial Sweeteners."
- *ChemMatters*, April 1989, pp. 4–7, "Mirror Molecules."
- *ChemMatters*, December 2002, pp. 4–6, "Images of Anthrax."