

## Teacher's Guide: ACTIVITY 3

### CHEMICAL PROPERTIES: COMPARISONS OF SUBSTANCES

#### OVERVIEW:

Students will assume the roles of SREL environmental chemists as they work to identify an unknown substance resulting from a mock accident and chemical spill; i.e., a white powder leaking from a vehicle overturned on the Hwy. 278 Bridge crossing Upper Three Runs Creek. Students will conduct physical and chemical tests to identify the unknown substance after first conducting tests on known substances. In the science seminar students will discuss how they formed their conclusions.

#### TERMS WE WILL BE USING:

- **Content related**—chemistry, matter, states of matter, atom, molecule, mixture, compound, solid, liquid, gas, subatomic particles, proton, neutron, electron, Periodic Table of Elements
- **Process related**—observation, hypothesis, comparison, classification, prediction, independent variable, dependent variable, inference, data

#### OUTLINE OF WORKSHOP:

The first 40 minutes will be a review of the last lesson (biodiversity) and an introduction to content in chemistry. This week's featured SREL scientist is Dr. Brian Jackson, who is an environmental chemist. The slide show introduction will acquaint students with chemistry content, including atoms, elements, atomic structure, molecular compounds, and the Periodic Table of Elements (i.e., material from Unit E, "The Building Blocks of Matter," in the science text book). This intro will conclude with a few illustrations of how Brian, an SREL chemist, uses physical and chemical tests to determine unknown compounds in samples that he analyzes.

Students will then break out into groups of four to conduct their own chemical analyses of four known substances and an unknown substance from the "spill." The scenario for the exercise will be that they are acting as student investigators for a HazMat drill. After some demonstrations of various chemical tests, students will follow instructions to analyze their samples for physical properties and chemical reactivity. When necessary students will share their data with the entire group so that everyone has a complete data sheet.

During "science seminar" closure we will discuss the results, and attempt to identify to unknown substance by comparing test results to those from analyses of known substances.

#### STANDARDS COVERED:

Sci	Earth Sci	Changes in surface: land and ocean	formation/SC regions/weathering processes
Sci	Earth Sci	Changes in surface: land and ocean	water cycle
Sci	Phy Sci	Mixtures and solutions	properties--mixtures vs. solutions, concentrations
Sci	Phy Sci	Mixtures and solutions	properties--solubility, pollutants
Sci	Inquiry	Process skills	observe, classify, measure, communicate, infer, predict, hypothesize
Sci	Inquiry	Inquiry skills	Plan and conduct simple investigations
Math	Alg-S2	Represent and analyze mathematical structures	Use variables
Math	Alg-S4	Analyze change	How one variable affects another

Math	Alg-S4	Analyze change	Compare varying rates of change
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### SUGGESTED FOLLOW-UP ACTIVITIES:

#### Science and Math

- **Follow up sheet**—Do the science/math follow-up sheet for the Activity 3 chemistry workshop.
- **Model**—A model is a representation, usually on a small scale, that shows the construction or is a copy of something. Make a science model on the structure of a molecule to display it in your classroom.
- **Mini-Experiment**—Miniature Pop Rockets. Lead your class in a mini acid/base reaction chemistry demonstration. You'll need to collect enough empty plastic film canisters with lids so that each of your class mates can have one. (You can get these for free from any store that develops film on site.) You'll also need enough straws so each student can have one, a box of store brand "alka seltzer", and some water. First do your research: go to [www.howstuffworks.com](http://www.howstuffworks.com) and search for the topic "alka seltzer". Find out all you can about what happens when you mix water with alka seltzer. You're mixing a solid (that contains an acid and a base) with a liquid and getting a gas! Before you have your classmates do the experiment ask them to make a hypothesis as to what they think will happen when they mix water and alka seltzer: **Example:** "I think that if I mix alka seltzer with water then nothing will happen." Have them test their hypothesis. Each student should have a film canister, a straw, a half a piece of alka seltzer, and a small cup of water. Have them clear off their desks, place the alka seltzer in the film canister, then add enough water to the canister to just cover the alka seltzer using the straw as pipette; about five drops, and immediately put the lid tightly on the canister, place the canister on the middle of their desk and have them sit back. POP!!! Explain to your classmates what happened inside of the canister.

#### Language Arts

- **Science Cards (Writing)**—Using large index cards make science cards (similar to baseball cards) that include the vital statistics of at least five elements. On one side write the element name, symbol, atomic number, and atomic weight. On the other write some fun facts about the element. Trade with other students.
- **Research (Writing)**—Research the Periodic Table of the Elements. Choose one element from the Periodic Table and research its history, how it was discovered and by whom. Write a short paper on what you found out.
- **Biography (Reading)**—A biography is a written account of a person's life. It tells when and where a person was born, as well as other important details of the person's life. Read a biography of a chemist.
- **Flashcards (Vocabulary)**—Make vocabulary flashcards from the Activity 3 definitions sheet and spend 10 minutes every day studying your cards.
- **Haiku**—Haiku is a Japanese form of poetry that creates a mood or suggests a feeling. It is measured by the number of syllables in the line. Haiku has three lines with 5, 7, and 5 syllables. Write haiku on a molecules and atoms. **Example:** Element so small/Carbon in my bones and skin/We all share atoms.

#### Technology

- **Webpage**—Work with SREL instructors to add chemistry material to their educational webpage.

#### Art

- **Mural**—A mural is a picture painted or drawn on a wall or on long pieces of newsprint or other paper. Create a mural on the plant and animal life of Upper Three Runs Creek (the creek protected from the chemical spill).