Gold Seal Lesson:

Copernicus Education Gateway

Author(s): ***Michael Lucky Voiselle***			***Lesson Title:*** ***ALKA-SELTZER BOMB ANALYSIS***			
Grade Span			***ICLE Application Model***			
K-4	***5-8***	***9-12*** ***XX***	***A***	***B***	***C***	***D*** ***XX***

Instructional Focus:

Reading Students read a variety of grade level materials, applying strategies appropriate to various situations
Algebraic Concepts and Relationships Students use algebraic methods to investigate, model, and interpret patterns and functions involving numbers, shapes, data, and graphs in a problem-solving situation. Students evaluate and communicate the reasoning used in solving these problems.
Science as Inquiry Students demonstrate knowledge and skills necessary to perform scientific inquiry.
Science in Personal and Social Perspectives Students apply scientific principles to personal and social issues.

Performance Task

You are to explore the behavior of gases released in an enclosed area. Obtain a film canister from the photography center at Wall-Mart or K-Mart. They throw away daily, therefore you can get one free for a school project. Fill the canister one-fourth full of water, place canister on a tabletop, drop one-half of a fresh Alka-Seltzer tablet inside, and immediately place the top on the canister. Record all observations and comments in your science journal. Repeat the experiment several times to record observations you may have not noted.

What happens when you first put the tablet in the water? What did you notice? What do you notice when you look at the lid of the canister during the reaction?

Determine the chemical reaction by looking at the chief ingredients on the tablet package. Balance the reaction according to stoichiometry. What makes the lid pop off the canister?

Try baking soda and water or vinegar. Does this reaction work? Why or why not? Take time here to write a summary of this experiment and address the questions above. All write-ups are to be well-written and free from spelling and grammatical errors.

Your next task is to vary the amount of water using $1/4^{th}$ of an Alka-Seltzer tablet. Begin with 3milliters of water, then 6mLs, and 9mLs and so on. Record the height that the lid reaches in each trial. Experiment using a clear plastic canister where the lid slides inside the canister, and a black canister where the lid covers the outside of the container. Determine which container is best to use for this experiment and why? Record the change in amount of water with the height in a neatly organized data table. Plot a graph of your results. Remember the controlled variable is the x-axis and the responding variable is the y-axis. What can you conclude from your graph? Is this a direct or indirect relationship? Is there such a point where too much water is added? Why is this the case?

Your next task is to keep the water constant at one-fourth full and vary the Alka-Seltzer amount by dividing 2 tablets into 16 equal amounts. I suggest weighing the two tablets, divide that weight by 16 and weigh into 16 equal parts. Place 1 sixteenth, then 2 sixteenths, then 3 sixteenths, and so on until you have 5 trials. Plot a graph of the change in Alka-Seltzer amounts versus the height. What can you conclude from this experiment?

Your next task is to explore the time it takes for the lid to pop off by varying the size of a half tablet in a constant amount of water. Fill the container $1/4^{th}$ full of water and put a 'whole' half tablet in the canister and record the time for lift off. Repeat using another half tablet broken into 3 pieces, then into 6 pieces, then into 12 pieces, and finally crushing the half tablet.

Plot a graph with number of pieces and the time for the lid to pop. Be sure to clean the canister after each trial, or have many clean canisters available. What can you conclude about the size of the particles and the time of top lift-off?

Take time out here to write a second write-up summarizing the results, observations, and answers to the questions presented in the three experiments above using the graphs for supportive evidence.

Finally each of your group is to research one of the following. You are to present your findings in an oral presentation to the rest of the group. They will take notes and include in a final write-up.

1. What type of chemical reaction is this: endothermic or exothermic and why? (Feel the canister before and after the lid pops off.)
2. How do these experiments relate to natural earth processes such as volcanoes and geysers?
3. What are some practical applications of this activity? (Think of carbonated drinks, model rocket launches, and propulsion for space vehicles.
4. Explore projectile motion by tilting the canister at 30degree, 45degree, and 60degree angles, record the distance of the lid traveled, and develop reasons why the 30degree and the 60degree fell close to the same spot.
5. Explore how Boyle's Law plays a role in this experiment.

ICLE Essential Skills

Apply in writing the rules and conventions of grammar, usage, punctuation, paragraphing and spelling. (ela1)
Identify, collect and/or select pertinent information while reading. (ela5)
Follow written directions carefully and accurately. (ela6)
Use writing as a tool for learning in formats such as learning logs, laboratory reports, note-taking, journals and portfolios. (ela40)
Understand the best procedures for statistical ***data collection, organization, and display*** including making estimates and predictions and drawing inferences**.** (m5)
Know the components and properties of the ***rectangular coordinate system***, (i.e., x - y axis, origin, quadrants, abscissa (x-coordinate) and ordinate (y-coordinate), and the general representation of a point (x,y)). (m23)
Know and apply the principles of scientific inquiry. *(Implicit in this statement are the processes of prediction, estimation, developing hypotheses, drawing conclusions, evaluation, and following ethical principles and professional procedures.)* s114
Use stoichiometry to compute quantitative relationships implied by chemical formulas (e.g., find the percent composition by mass of an element in a compound and the simplest ratio in which the atoms combine to form a compound) and chemical equations (e.g., solve mass, mass-volume, and volume problems). (m111)
Make observations using senses and instruments. Inferences and interpretations are arrived at based on observations. Classify observable properties and organize observations in a meaningful and logical way. (s5)
Know the relationships between local atmospheric variables (e.g., temperature, pressure, moisture, wind, etc.). (s16)
Exhibit good data management skills by collecting, organizing, and graphing data. (s19)
Understand and apply kinematics (i.e., the mathematical methods of describing motion without regard to the forces that produce it, such as velocity, acceleration and deceleration, and displacement). (s77)

Scoring Guide:

RATE THE CRITERIA: 3=Excellent, 2=Satisfactory, 1=Unsatisfactory, 0=Does not attempt or does not understand

CRITERIA	**SCORE**
Student worked well and contributed to group work	_____
Student was able to determine the chemical reaction of the substances	_____
First summary addressed all questions	_____
First summary was well organized and free from spelling and grammatical errors	_____
Student prepared a well organized data tables for all 3 experiments	_____
Graphs were neatly done and labeled correctly	_____
Second summary addressed all questions with explanations reflecting much thought	_____
Second summary was well organized and free from spelling and grammatical errors	_____
Student researched 1 of the 5 questions and presented an excellent oral presentation to the group	_____
Final summary write-up addressed 4 of the questions in a well organized manner	_____
Final summary write-up was well organized and free from spelling and grammatical errors	_____
Student demonstrated an understanding for pressure built-up, relation to particle size, and amounts of reactants	_____

Keywords

English Language Arts	Mathematics	Science
Reading **Research**	**Algebra** **Graphs** **Manipulatives**	**Earth Science** **Gases** **Heat Models/construction** **Volcanoes**
Writing **Spelling** **Grammar** **Organization** **Journals** **Technical Writing**	**Geometry**	**Life Science**
Communications **Oral Presentation**	**Statistics**	**Chemistry** **Gas Laws** **Lab Experiments** **Reactions** **Scientific Process**
Literature	**Calculus**	**Physics**
Other	**Trigonometry**	**Other**
	Other	