



Gold Seal Lesson:

Copernicus Education Gateway

Author(s): <i>Michael Lucky Voiselle</i>			Lesson Title: <i>ALKA-SELTZER CARBON DIOXIDE BUBBLY</i>			
Grade Span			ICLE Application Model			
<i>K-4</i>	<i>5-8</i>	<i>9-12</i> <i>XX</i>	<i>A</i>	<i>B</i>	<i>C</i> <i>XX</i>	<i>D</i>

Instructional Focus:

Reading

Students read a variety of grade level materials, applying strategies appropriate to various situations

Measurement

Students use a variety of tools and techniques of measurement in a problem-solving situation. Students 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

Your task is to determine how much carbon dioxide is given off in an Alka-Seltzer tablet. Examine the Alka-Seltzer label and determine the two main ingredients. Record all data and information in a science journal. This will be important to help prepare a well-organized data table and a well-written summary write-up. You may work in groups of 3.

You will need a triple beam balance that is accurate to a $1/100^{\text{th}}$ of a gram, an Alka-Seltzer tablet, a 2Liter flask, a rubber or a cork stopper and access to water. Prepare a neatly organized data table containing the following information:

Mass of 2liter flask

Mass of 2L flask plus 250mLs of water

Mass of flask, water and an Alka-Seltzer tablet placed on the balance platform (Do not place in the water yet)

Mass of tablet

Mass of water

Now add the tablet to the water and wait 20 minutes or until the reaction is over and mass the final mass of the flask, water, and remains of the tablet

You are to determine the chemical reaction for sodium bicarbonate and citric acid to yield carbon dioxide and two other products, and balance the equation before proceeding.

From the information above and your knowledge of stoichiometry, compute the mass of carbon dioxide lost, convert mass of carbon dioxide lost to moles, compute the moles of sodium bicarbonate reacted, and convert moles of sodium bicarbonate to grams reacted.

Compute a relative error using the grams of sodium bicarbonate in tablet claimed by manufacturer as the true value. This can be obtained from the back of the tablet package. Assume your value to be the experimental value. Subtract the true value from the experimental value, divide that subtraction by the true value, and multiply this small number by 100 percent to obtain the percentage of error. The experimental error will be above 15% which is extremely high. Can you offer suggestions to obtain a lower percentage of error? Give several reasons why your measured mass of carbon dioxide did or did not equal the amount on the label. (Remember that gasses dissolve in liquids)

Repeat the experiment placing a rubber stopper on the 2L flask. Record all measurements as before however, you must include the mass of the stopper. What reasons can you suggest as to why the measurements have changed? Remove the stopper after the reaction has stopped and all measurements taken. What happens? Why are we not worried about the rubber stopper blowing off of the 2L flask? What is the difference between the open flask and the stoppered flask experiment that gives different results?

You are to summarize your results, thoughts, problems incurred, and how you solved the problems in a conclusion summary. This summary must be well organized and free from spelling and grammatical errors. You may use any resources available to you including textbooks, magazines, encyclopedias, and the Internet.

You are to research and prepare a second write-up addressing the following questions. This write-up must also be well written and free from spelling and grammatical errors.

1. What is the purpose of carbon dioxide being released from the Alka-Seltzer tablet?
2. What is the importance of carbon dioxide in the carbon-oxygen cycle?
3. Why is it important to control the levels of carbon dioxide in the atmosphere? (Think of global warming or the greenhouse effect)
4. Cite 6 processes that give rise to large amounts of carbon dioxide being released into the atmosphere daily.
5. Does the amount of carbon dioxide in the atmosphere vary with seasons or time of day?
6. What is the role of sodium bicarbonate in Crazy Candies, Mad Dawg bubble gum, Fizzies, Face Slammers bubble gum, and Pop Rocks candy?

ICLE Essential Skills

Apply in writing the rules and conventions of grammar, usage, punctuation, paragraphing and spelling. ELA1
Discriminate important ideas from unimportant ideas while reading. ELA15
Present information in well-organized fashion that will be clear to the target audience. (ela11)
Understand basic algebraic properties (i.e., commutative: $ab = ba$; associative: $ab(c) = a(bc)$; and distributive: $a(b+c) = (ab)+(ac)$). M3
Understand the best procedures for statistical data collection, organization, and display including making estimates and predictions and drawing inferences. M5
Know and apply the principles of scientific inquiry. <i>(Implicit in this statement are the processes of prediction, estimation, developing hypotheses, drawing conclusions, evaluation, and following ethical principles and professional procedures.) (Not Ranked) S 114</i>
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
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)
Understand the historical development of the periodic table and apply the principles inherent in its development, including the properties and atomic structure of elements and resultant chemical compounds, the forces acting between and among atoms and molecules, and changes in substances as a result of chemical combination. S78
Know how to determine percent error wherever applicable. S92
Understand the concept and interpretation of the mole and the gram atomic mass, gram molecular mass, and molar volume of a gas. S104

Scoring Guide:

4. Student works well and contributes to his group. Student presented a well-organized data table that included all measurements in proper units. Student was able to determine and balance the chemical reaction. Student was able to use stoichiometry and convert grams to moles and moles to grams. Student repeated the experiment and offered viable reasons for the difference in percentage of error values. Student presented a well-written summary addressing all questions and was free from spelling and grammatical errors. Second summary demonstrated much research, addressed all 6 questions and demonstrated an understanding for the role of carbon dioxide in a variety of circumstances.

3. Student works well and contributes to his group. Student presented a well-organized data table that included all measurements in proper units. Student was able to determine and balance the chemical reaction. Student was able to use stoichiometry and convert grams to moles and moles to grams. Student repeated the experiment but could not offer viable reasons for the difference in percentage of error values. Student presented a well written summary free from spelling and grammatical errors, but did not address all questions. Second summary addressed all 6 questions but did not demonstrate an understanding for the role of carbon dioxide in a variety of circumstances.

2. Student works well and contributes to his group. Student presented a well organized data table that included all measurements in proper units. Student was able to determine and balance the chemical reaction with some guidance. Student was able to use stoichiometry and convert grams to moles and moles to grams with some guidance. Student repeated the experiment but could not offer viable reasons for the difference in percentage of error values. Student summary was not well written but addressed all questions and was free from spelling and grammatical errors. Second

summary addressed all 6 questions but did not demonstrate an understanding for the role of carbon dioxide in a variety of circumstances and contained many spelling and grammatical errors.

1. Student works well and contributes to his group. Student presented a well organized data table that included all measurements in proper units. Student was unable to determine the balanced chemical reaction nor use stoichiometry even with guidance. Student repeated the experiment but could not determine the percentage of error values. Both summaries contained many spelling and grammatical errors and did not address all questions. Student did not demonstrate an understanding for the role of carbon dioxide in a variety of circumstances.

Keywords

English Language Arts	Mathematics	Science
Reading Research Comprehension	Algebra Equation Algebraic Operation	Earth Science
Writing Grammar Spelling Expository	Geometry	Life Science
Communications	Statistics	Chemistry Environment Reactions Scientific Process Lab Experiment Chemistry in Daily Life
Literature	Calculus	Physics
Other	Trigonometry	Other
	Other	