CHEMICAL REACTION IN A BAGGY

INSTRUCTIONS

(MODIFIED FOR ADEED)

Overview:

Students investigate chemical reactions using given substances. Students identify chemical reactions in their daily lives.

Objectives:

The student will:

- identify that a chemical reaction has taken place;
- perform an experiment using variables to create chemical reactions; and
- identify chemical reactions that have taken place around them.

Targeted Alaska Grade Level Expectations:

Science

[9] SB3.1 The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on the systems by recognizing that a chemical reaction has taken place.

[9] SA1.1 The student demonstrates an understanding of the process of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

[9] SA1.2 The student demonstrates an understanding of the processes of science by hypothesizing, designing a controlled experiment, making qualitative and quantitative observations, interpreting data, and using this information to communicate conclusions.

Vocabulary:

chemical – relating to or produced by means of chemistry; a substance obtained by or used in a chemical process; a chemical compound

chemical reaction – a rearrangement of the atoms or molecules of two or more substances that come into contact with each other, resulting in the formation of one or more new substances

chemistry – the scientific study of the structure, properties, and reactions of the chemical elements and the compounds they form; the composition, structure, properties, and reactions of a substance

products – a substance produced during a natural, chemical or manufacturing process

reactant – a substance participating in a chemical reaction, especially one present at the start of the reaction

Materials:

Gear up (teacher demonstration):

- Plastic zipper type sandwich baggie
- Baking soda (sodium bicarbonate $2NaHCO_3$)
- Dilute hydrochloric acid HCl or vinegar (approximately 2 milliliters)
- Plastic pipette
- Chart paper posted on walls (3-4 pieces)
- Triple beam balance or electronic milligram balance (one per group)
- Plastic zipper bag (three or more per group)
- Plastic pipette (one per group)
- Alka Seltzer™ tablets
- Antacid tablets
- White chalk
- Safety goggles (one per student)
- Chemical aprons (one per student)
- Science journal or blank piece of paper
- STUDENT LAB: "Plop, Plop, Fizz, Fizz"

CHEMICAL REACTION IN A BAGGY

INSTRUCTIONS

Activity Preparation:

1. Make sure all materials are available for demonstration and student activity. Small groups are asked to perform three separate trials using the materials, so make sure enough is available.
2. Students will wear safety gear: eye protection and chemical aprons. Be sure these items are available.
3. Students must properly dispose of materials. Have a procedure in place before starting.
4. Teacher should wear gear to set a good example.

Activity Procedure:

NOTE: The scoring guide and assessment task are located at the end of the lesson. Please share them with students before beginning the lesson.

Gear Up:
Process Skills: Observing, communicating

1. Begin by asking students the following questions about what they know about chemical reactions, and record their responses on chart paper.
   a. How can you tell if a chemical reaction has taken place?
   b. How do you know this is not a physical change?
   c. What are some examples of chemical reactions?
2. Perform the following demonstration:
   - Place 5 grams of baking soda in a baggie.
   - Fill pipette with approximately 2 milliliters of vinegar.
   - Carefully place filled pipette in the bag and seal the baggie. Be careful not to allow any liquid to leak from the pipette.
   - Direct the stem of the pipette toward the baking soda, and squeeze the contents of the pipette so that it reacts with the baking soda. Immediately remove the pipette and seal the baggie.

   Allow students to make observations of the contents of the bag, noting bubble formation and baggie expansion. Discuss observations.
3. Write the definition for chemical reaction on the board (see Vocabulary). Ask: "What chemical reactions are going on around you every day?" Record student responses on the chart paper.

Explore:
Process Skills: Predicting, observing, inferring

4. Divide students into small groups then hand out STUDENT LAB: "Plop, Plop, Fizz, Fizz." Show students the materials listed under Reactants on the lab sheet. The lab sheet asks students, "Which set of reactants will produce new substances when combined? List three possibilities." Ask students to think about different combinations that might produce a reaction. Have students record their predictions on the lab sheet. Ask groups to share predictions and record them on chart paper or the board.
5. Review lab procedures required in STUDENT LAB: "Plop, Plop, Fizz, Fizz," including the importance following instructions step by step. Provide student groups with listed materials to use and explore. Students are asked to perform two trials, then make a list on the board of reactant combinations that produced a chemical reaction. Circulate to assess understanding. Ask students to complete the lab up to the conclusion, then clean up.
6. After clean up is complete, allow students to complete the lab, Part Three: Conclusion. This can be done in small groups or as an individual assignment.
7. Assessment Task: In their science journal or on a blank piece of paper students will write at least one paragraph using complete sentences and proper grammar. The paragraph must explain what a chemical reaction is and give at least two examples. The student will describe at least one chemical reaction that she/he encounters in everyday life.

Answers:

STUDENT LAB: "Plop, Plop, Fizz, Fizz"

Part One: Prediction

A. and B. Answers will vary.

Part Two: Investigation

All sections of the Investigation are dependent on student investigation. Answers will vary, but should reflect that student groups recorded their observations. Students provide a new prediction for the third trial.

Part Three: Conclusion

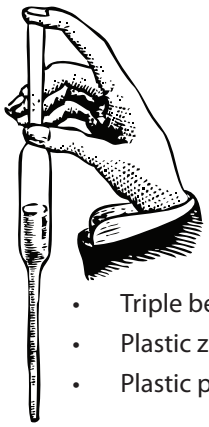
1. Any two of the following: color change, temperature change, precipitate has formed, an odor is produced, a texture change, weight change, a new substance has formed, gas bubbles form, it can no longer be separated into its original form, or other answers that are correct and appropriate.
2. You will not get an accurate assessment of the reaction that has occurred.
3. If the bag was not sealed there certainly could have been a mess, but more importantly some reactions produced gas. To accurately assess the reaction, the gas had to be captured and included in the weight. The gas (CO_2) was the result of the chemical reaction releasing the CO_2 from the solid material. (Note: Baking soda and vinegar yields sodium acetate, water, and carbon dioxide: $NaHCO_3 + CH_3COOH \rightarrow NaCH_3COO + H_2CO_3 \rightarrow NaCH_3COO + H_2O + CO_2$.)
4. The gas is generated from the chemical reaction.
5. Answers will vary, but may include the combustion of fossil fuels to energy (light, heat and carbon dioxide); digestion of food is transformed into energy; sunlight, water, and carbon dioxide photosynthesized by plants; decomposition, where plant and animal material break down into water and carbon dioxide; and burning wood releases energy and carbon dioxide.

Scoring Guide

GLE/Standard	Below Proficient	Proficient	Above Proficient
GLE [9] SB3.1	Student explains what a chemical reaction is and gives one example	Student explains what a chemical reaction is and gives two examples.	Student explains what a chemical reaction is and gives three or more examples.

NAME: _____

PLOP, PLOP, FIZZ, FIZZ



Materials

- Triple beam balance (one)
- Plastic zipper bag (up to nine)
- Plastic pipette (one)

Reactants

- Baking Soda (sodium bicarbonate $2NaHCo_3$)
- Vinegar
- Water (H_2O)
- Alka Seltzer™ tablets
- Antacid tablets
- White chalk

Quantities at Start

- **Baking soda** ($2NaHCO_3$) – **start** with 5 grams.
- **Vinegar – start** with 2 milliliters
- **Hydrochloric Acid** (HCl) – **start** with 2 milliliters
- **Alka Seltzer – start** with one tablet
- **Antacid – start** with one tablet
- **White chalk –start** with ¾ inch piece

Part One: Prediction

1. Which set of reactants will produce a new substance when combined? Combine one liquid and one solid each time.

   A. Choose two reactants:

   _____

   B. Change out one of the above reactants:

   _____

Part Two: Investigation

TRIAL ONE A

1. List the two reactants from Prediction A. Include the quantity you will use to start. Recommended quantities are listed on the right.

   _____

   _____

2. What do you think will happen when these two reactants are combined?

   _____

   _____

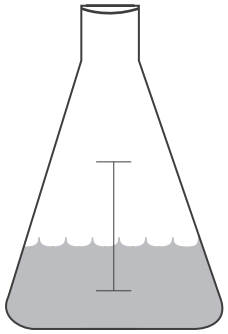
3. Using a plastic zipper bag as your container, use the pipette to add the correct amount of any liquid listed as a reactant. Seal the bag. Place the bag (with liquid inside), and any solid reactant on the triple beam balance and weigh.

   Weight prior to reaction: _____

4. Add the second reactant to the baggie and immediately seal. Describe the observed reaction. Did it match your prediction?

   _____

   _____



5. Weigh the sealed bag.

   Weight after reaction: _____

   Did the weight change? What is the difference, if any? _____

6. Open the baggie (without spilling the contents) and squeeze out excess gases. Reseal the baggie and weigh it again.

   Weight: _____

   Did the weight change? What is the difference, if any? _____

7. Discuss any difference in weight between steps 4 and 6. To what do you attribute any difference?

   _____

TRIAL ONE B

1. List the two reactants from Prediction B on page one. Include the quantity you will use to start. Recommended quantities are listed on page one.

   _____ _____

2. What do you think will happen when these two reactants are combined?

   _____

   _____

3. Using a plastic zipper bag as your container, use the pipette to add the correct amount of any liquid listed as a reactant. Seal the bag. Place the bag (with liquid inside), and any solid reactant on the triple beam balance and weigh.

   Weight prior to reaction: _____

4. Add the second reactant to the baggie and immediately seal. Describe the observed reaction. Did it match your prediction?

   _____

   _____

5. Weigh the sealed bag.

   Weight after reaction: _____

   Did the weight change? What is the difference, if any? _____

6. Open the baggie (without spilling the contents) and squeeze out excess gases. Reseal the baggie and weigh it again.

   Weight: _____

   Did the weight change? What is the difference, if any? _____

7. Discuss any different in weight between steps 4 and 6. To what so you attribute any difference?

   _____

8. Report results of Trials A and B to the class. On the board, make a list of combined reactants that produced a chemical reaction.

TRIAL ONE C

1. From the list on the board, choose two of the reactants that produced a chemical reaction. Change the amount of one or both of the reactants. List the quantity you will use.

   _____ _____

2. Make a new prediction. What do you think will happen when the amount of the reactant(s) has changed?

   _____

3. Using a plastic zipper bag as your container, use the pipette to add the correct amount of any liquid listed as a reactant. Seal the bag. Place the bag (with liquid inside), and all solid reactants on the triple beam balance and weigh.

   Weight prior to reaction: _____

4. Add all of the reactants to the baggie and immediately seal. Describe the observed reaction. Did it match your prediction?

   _____

   _____

5. Weigh the sealed bag.

   Weight after reaction: _____

   Did the weight change? What is the difference, if any? _____

6. Open the baggie (without spilling the contents) and squeeze out excess gases. Reseal the baggie and weigh it again.

   Weight: _____

   Did the weight change? What is the difference, if any? _____

7. Discuss any different in weight between steps 3 and 6. To what do you attribute any difference?

   _____

   _____

Part Three: Conclusion

Directions: Answer the following critical thinking questions.

1. List ways you can recognize that a chemical reaction has taken place.

   _____

2. Why is important that measurements are made accurately?

   _____

   _____

3. Why was it necessary for the plastic baggie to be sealed?

_____

_____

4. When the bag(s) expanded, gas had been released. Where did it come from?

_____

_____

Part Four: Application

1. What chemical reactions are taking place in the environment around you right now? Name at least three. (Think about your community, school and home.)

_____

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