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Maintaining Mass

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Focus on Inquiry

The student will demonstrate that mass is conserved when substances undergo chemical and/or physical changes through experimentation and evaluation of experimentation procedures. Students will be able to analyze the demonstration and provide evidence for or against the law of conservation of mass.

Lesson Content Overview

Students will first view and then hypothesize, based on their knowledge of the law of conservation of mass, why a teacher demonstration does not seem to prove the law. Students will then explore a modified version of the experiment to determine ways that the teacher demonstration should have been changed to show conservation of mass effectively.

Duration	Setting	Grouping	PTI Inquiry Subskills
90 minutes	Classroom	Whole Class, Pairs	1.1, 1.3, 2.4, 2.5, 3.1, 5.2, 5.8, 6.1, 7.3

Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
Engage	10 min	1.3, 5.2	Projector YouTube	3	Students will view time lapsed videos of both a building being built and a plant growing and will answer questions about their observations.
Explore	30 min	1.1, 2.5, 3.1	Document Camera, Digital Scales	3	Students will observe a teacher demonstration and then complete an experiment to show evidence of conservation of mass during a chemical change of matter.
Explain	20 min	7.3	None	2	Students will compare and contrast the two experiments and answer questions, discussing their answers and additional observations with the class.
Expand	20 min	6.1, 2.4, 5.8	Digital Scales	3	After creating a plan, students will modify teacher demonstration to make it properly describe conservation of mass.
Evaluate	10 min		None	1	Students will answer 5 assessment questions related to evidence of conservation of mass.

Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

Next Generation Science Standards – Inquiry

NGSS Practice 3: Planning and Carrying Out Investigations
NGSS Practice 6: Constructing explanations
NGSS Practice 8: Obtaining, Evaluating and Communicating Information

Next Generation Science Standards – Physical Science

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Florida Science Standards – Nature of Science

SC.8,N.1.3 Use phrases such as “results support” or “fail to support” in science.
SC.8.N.1.1 Plan and carry out scientific investigations of various types.

Florida Science Standards – Physical Science

SC.8.P.9.1 Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

Materials and Advance Preparation

Materials List

Student Materials:

- Law of Conservation of Mass Explained Lab sheet (one per student)
- Checking for Understanding Worksheet (one per students)

Group Materials:

- Sandwich or quart sized zipper baggies (1 per student group)
- Small medicine cups (2 per student group)
- Vinegar (20 mL per student group)
- Baking Soda (20 grams per student group)
- 100 mL Beakers (1 per student group)
- 250 mL Erlenmeyer Flasks (1 per student group)
- Effervescent Tablets (1 per student group)
- Tap Water (100 mL per student group)
- Balloons (1 per student group)
- Digital Scales (1 per student group) *NOTE: It will be easier for the students if your digital scales measure to the nearest tenth or hundredth rather than rounding to the nearest gram. A traditional balance may be substituted for the digital scale.

Blackline Masters

1. **Blackline Master #1:** "Law of Conservation of Mass Explained" Lab Sheet
2. **Blackline Master #2:** "Checking for Understanding: Maintaining Mass" Worksheet

Advance Preparation

1. Setup teacher demonstration
2. Write/Project the Law of Conservation of mass (as a statement without explanation) in a spot that can be easily seen throughout the lesson.
3. Access time lapse videos.
    a. Time Lapse Plant Growth (time 0:0:45): https://youtu.be/d26AhcKeEbE
    b. Time Lapse Building Construction (time 0:2:31): https://youtu.be/rwvmru5JmXk

    NOTE: *If there is an advertisement at the beginning of the video, please fast forward or "Skip" through the ad if available. Make sure to display the video full screen (arrows to the right of video time bar at the bottom of the screen) so that the web page advertisements and other suggested videos are not seen. Watch for and close any pop-up ads that may occur during the video.*

    If you have limited access to youtube.com, you can upload the videos into a free program such as edpuzzle.com and stream the videos from there.
4. Separate materials into sets for each group or set up stations for students to gather materials.
5. Make copies of **Blackline Master #1** (one per student)
6. Make copies of **Blackline Master #2** (one per student)

Lesson Information

Learning Objectives

1. The student will be able to analyze a provided demonstration in order to conclude if it is an accurate representation of conservation of mass.
2. The student will be able to properly demonstrate the conservation of mass through an experiment.

3. The student will be able to correctly hypothesize and modify the provided demonstration in a way that will make it an accurate presentation of conservation of mass.

Prior Knowledge Needed by the Students

- Students should have prior experience with determining between physical and chemical changes in matter and describing evidences of both.
- Students should have prior knowledge about matter and the periodic table.

Background Information

A wooden log has the chemical property of being flammable. It can undergo the chemical change of combustion (burning). If you were to burn a large log in a bonfire until you could no longer see the log, you would be left with a pile of ashes. Light, heat and smoke would all have been given off during the chemical change of burning. The fact that the log is no longer visible and that ash has been left behind, as well as the energy changes resulting in heat and light, are evidences that a chemical change has occurred.

Many observers of this bonfire may assume that the matter making up the log was lost or destroyed during the fire due to the fact that the ashes left behind are significantly smaller in volume than the original log. A comparison of the mass of the log prior to the bonfire and the ashes after the bonfire would show that the mass has decreased as well. However, if you were able to collect all of the smoke, gas and oxygen involved in the burning process and were to combine those particles with the remaining ash, you would discover that the total amount of matter was maintained throughout the process. The total amount of mass would also be the same from beginning to end.

According to the Law of Conservation of Mass, mass is never created nor destroyed in a chemical reaction. The Law of Conservation of Mass states that the total mass of the reactants in a chemical reaction will equal the total mass of the products resulting from a chemical reaction. Reactants are the all of the substances present at the beginning of the reaction. Products are the substances remaining after the chemical reaction.

Lesson Procedure

Engage

1. Allow students to view a time lapse video of a building being built. [Time Lapse Building Construction (time 0:2:31): https://youtu.be/rwvmru5JmXk]
    a. ***NOTE:*** *If there is an advertisement at the beginning of the video, please fast forward or "Skip" through the ad if available. Make sure to display the video full screen (arrows to the right of video time bar at the bottom of the screen) so that the web page advertisements and other suggested videos are not seen. Watch for and close any pop-up ads that may occur during the video.*
2. Following the video, ask students the following questions:
    a. What did you notice in this video? *Student answers will vary*
    b. What sorts of materials do they see? *Student answers will vary*
    c. What are those materials made of? *Student answers will vary– trying to get students to see that these building materials are made of the different elements*
    d. *These questions can be answered as a whole group discussion or with shoulder or table partners.*
3. Allow students to view a second time lapse video of a plant growing. [Time Lapse Plant Growth (time 0:0:45): https://youtu.be/d26AhcKeEbE
    a. ***NOTE:*** *If there is an advertisement at the beginning of the video, please fast forward or "Skip" through the ad if available. Make sure to display the video full screen (arrows to the right of video time bar at the bottom of the screen) so that the web page advertisements and other suggested videos are not seen. Watch for and close any pop-up ads that may occur during the video.*
4. Following the video, ask students the following questions:
    a. What did you notice about the plant growing? *Student answers will vary but could include that the green matter got bigger and bigger and the roots got longer and longer.*

b. What different stages of growth do they see? *Student answers will vary but could include that they saw the plant begin as a seed, germinate, and then grow into a full grown plant.*
c. What different plant parts do they see? *Student answers will vary but could include that they see roots, leaves, stems*
d. Where did the matter come from that formed the plant parts? *Student answers will vary but could include that they came from the carbon that was removed from the air during photosynthesis. Students might also suggest that matter came from the soil.*
e. *These questions can be answered as a whole group discussion or with shoulder or table partners.*

5. Provide each student with a copy of the "Law of Conservation of Mass Explained" Lab sheet (**Blackline Master #1**).
6. Have students answer the two questions in the *Engage* portion of the sheet to reflect on what they have just seen in the videos.
   a. Time Lapse Construction:
   When we build new cities,
      a. the total mass of the earth decreases.
      b. the total mass of the earth increases.
      c. the total mass of the earth remains the same.

   Why did you select this answer? *Student answers will vary*
   b. Time Lapse Plant Growth:
   When new plants grow,
      a. the total mass of the earth decreases.
      b. the total mass of the earth increases.
      c. the total mass of the earth remains the same.

   Why did you select this answer? *Student answers will vary*
7. Explain to students that you will be coming back to these questions after you explore a little further.

Explore

1. Tell students that you will be showing them a demonstration of the reaction between an effervescent tablet (effervescent tablet) and water. Ask students if anyone has seen what happened when an effervescent tablet is dropped in water. Allow students to share their experiences. *Student responses will vary*
2. Tell students that you will be adding one effervescent tablet into 100 mL of water. Have students hypothesize on the "Pre-Demo" line of the Explore: Part A portion of **Blackline Master #1** what they think will happen to the mass of the experiment as they add the two ingredients together.
3. Demonstrate for students, using document camera if accessible, how to use a digital scale or triple beam balance to find the starting masses of the effervescent tablet, the water, and the Erlenmeyer flask. Record these measurements in the chart in the "Demo" section of your lab sheet.
4. Add the mass of the effervescent tablet, the water, and the Erlenmeyer flask together to find your total mass before beginning the experiment.
   a. ***Note:** During this part of the demonstration, many teachers may find it necessary to show students how to use filter paper for cleanliness, how to eliminate the container mass to account for only the substance, or how to use the scales available in the classroom. You may also review physical changes in matter if your effervescent tablet breaks rather than choosing to use a fresh tablet.
5. Place an effervescent tablet into an open Erlenmeyer flask of 100 mL of water. Allow the effervescent tablet to fully dissolve in the water while your students watch. Once the reaction has stopped, take a final mass measurement. Record this data in the data table in the "Demo" portion of the Explore: Part A portion of your lab form. You may choose to allow students to watch the reaction happen and the data values change on the digital scale by placing your demo under the camera of a document camera.
6. Allow students 2 minutes to answer the "Post-Demo" question. Ask for student volunteers to share their responses with the whole class, with a shoulder partner, or with a face partner.

Student responses will vary but should demonstrate a recognition that the mass of the reactants did not equal the mass of the products. At this point students may not be able to fully describe the reason behind the discrepancy in the data.

7. After a few minutes, display the law of conservation of mass and ask students to respond to the remainder of the Part A questions.
8. Tell students that they will now be completing a second experiment that can show conservation of mass. Instead of using effervescent tablet and water, students will use the reaction between vinegar and baking soda.
9. Students will follow the instructions in Explore: Part B of their lab form to complete an experiment demonstrating conservation of mass using baking soda and vinegar. Student instructions are listed below.

    Instructions:

    1. Place 20 g of Baking Soda in a medicine cup and find its mass.
    2. Place 20 mL of vinegar in a medicine cup and find its mass.
    3. Find the mass of the vinegar and record the mass of the vinegar and baking soda in your table.
    4. Record the masses of both in your data table.
    5. Place both containers into the zipper baggie without spilling the contents, remove as much air as possible from the bag, and tightly seal the bag.
    6. Tip the cups over to mix the vinegar and baking soda together without opening the bag.
    7. After all evidence of a reaction has stopped, find the final mass of all the contents within the bag (do not open the bag).After completing their experiment and data table, students will answer the reflection questions in the Explain portion of the lab sheet.

Explain

Some questions you might ask students while they work or after they are finished with their experiment include:

1. *What happened when you mixed the baking soda and vinegar? It bubbled*
2. *Do you think this reaction was a chemical or a physical change? Chemical change – gas production*
3. *Why do you think you had to be careful not to mix the baking soda and vinegar before you zipped the bag closed? The contents could have spilled or the gas would have escaped*
4. *During which parts of the experiment was it easiest to measure the mass? Why? Student responses may vary. Students may report that it was easier to mass before or after the experiment for a variety of reasons.*
5. *During which parts of the experiment did you find it difficult to take accurate measurements? Student responses may vary. Students may report that it was easier to mass before or after the experiment for a variety of reasons.*
6. *Describe the steps necessary to measure the mass of solids. Put the solid object onto the scale and observe the mass.*
7. *How do you have to change your procedures when you measure a liquid? Find the mass of an empty container. Pour the liquid into the empty container and find the mass again. Subtract the mass of the empty container from the mass of the container plus the liquid.*
8. *What special steps do you need to take to measure a gas? The mass of the container and the gas must both be found and then subtracted (like a liquid). The container must be able to be sealed.*
9. *Why is it important to measure the mass of each of the containers you will be using during an experiment? Because you will have to subtract the mass of these containers from the mass of the containers with liquids or gases in them.*

Expand

Students will now decide how to "fix" the initial teacher demonstration to show conservation of mass. Teacher should provide guidance and should approve any student experiments before allowing students to demonstrate their revised experiment. Guidance for this elaboration of the

lab is provided in the Expand portion of the student lab form. The best guidance that can be provided during this portion of the lesson is through the asking of questions to help students guide their exploration without providing them with explicit directions.

Evaluate

FORMAL EVALUTION

Students will complete the attached 5 question assessment "Checking for Understanding: Maintaining Matter" (**Blackline Master #2**). These questions assess Learning Objective 1. Learning Objectives 2 and 3 are performance based objectives and must be assessed based on performance during the lab.

INFORMAL or OPTIONAL EVALUTIONS

1. Students may be informally assessed on their responses during the Explain or Expand portions of the lesson.
2. Additionally, students may be informally assessed on their planning and preparation for the Expand activity.

WRAP UP.

Bring the lesson to a conclusion by revisiting the questions posed during the Engage portion of the lesson.

1. When we build cities here on earth, does the mass of the earth increase? How do you know? Students should now be able to respond that the matter used to build buildings came from the Earth, so the overall mass of the Earth does not change.

2. When new plants grow, does the total mass of the earth increase? How do you know? Students should now be able to respond that the matter used to form plant parts came from the Earth (atmosphere), so the overall mass of the Earth does not change.

Supplementary Resources

Teachers

Boundless. (2016). The Law of Conservation of Mass. Retrieved from https://www.boundless.com/chemistry/textbooks/boundless-chemistry-textbook/atoms-molecules-and-ions-2/history-of-atomic-structure-32/the-law-of-conservation-of-mass-194-3698/

Sterner, R. (2011). The Nature Project: The Conservation of Mass. Retrieved from http://www.nature.com/scitable/knowledge/library/the-conservation-of-mass-17395478

Students

Science Kids. (2015). Law of Conservation of Mass Info and Demonstration. Retrieved from http://stem-kids.blogspot.com/2015/05/the-law-of-conservation-of-mass.html

University of Utah. (n.d.) Law of Conservation of Mass with Examples. Retrieved from http://home.utah.edu/~u0577548/Conservation%20of%20Matter/sum_of_parts.htm

CITATION OF SOURCES.

__✓__ Yes, I cited all materials and resources used in this lesson.

Allyn Short

Lesson author signature

Blackline Master #1

Student Name: _____ Period: _____ Date: _____

Law of Conservation of Mass Explained

Engage: *After viewing the videos, tell me what you think:*

Time Lapse Construction:
When we build new cities,
A. the total mass of the earth decreases.
B. the total mass of the earth increases.
C. the total mass of the earth remains the same.
Why did you select this answer?

_____
_____
_____

Time Lapse Plant Growth:
When new plants grow,
A. the total mass of the earth decreases.
B. the total mass of the earth increases.
C. the total mass of the earth remains the same.
Why did you select this answer?

_____
_____
_____

Explore:
Part A: *Answer the following questions before, during, and after viewing the Teacher Demo.*

Pre-Demo: If I add together water and an effervescent tablet, will the total mass before mixing be less than, equal to, or greater than the mass after mixing? _____
Explain: _____
_____

Demo: Fill in the chart below while watching the demo:

Item	Mass Before Mixing	Mass After Mixing
Effervescent tablet		
100 mL Water*		
Erlenmeyer flask		
Total Materials		

*Calculating the mass of the water	
Mass of container and water	
Mass of container	
Mass of water	

Post Demo: What did you notice about the mass before and after mixing? How can you explain what you saw? _____
_____
_____

Did the effervescent tablet and water reaction support or fail to support the law of conservation of mass? Why or why not? _____
_____
_____

How do you think you could change the experiment to demonstrate the law of conservation of mass? _____

_____

_____

Did your data support or fail to support your hypothesis? Explain. _____

_____

_____

Explore:

Part B: *Using the materials provided and instructions listed below, conduct an experiment that will demonstrate that the Law of Conservation of Mass is valid. Record your group measurements in the data table provided.*

Instructions:

1. Place 20 g of Baking Soda in a medicine cup and find its mass.
2. Place 20 mL of vinegar in a medicine cup and find its mass.
3. Find the mass of the vinegar and record the mass of the vinegar and baking soda in your table.
4. Record the masses of both in your data table.
5. Place both containers into the zipper baggie without spilling the contents, remove as much air as possible from the bag, and tightly seal the bag.
6. Tip the cups over to mix the vinegar and baking soda together without opening the bag.
7. After all evidence of a reaction has stopped, find the final mass of all the contents within the bag (do not open the bag).

Item	Mass Before	Mass After
Vinegar & Cup		
Baking Soda & Cup		
Baggie		
Total		

Explain: *Answer the following questions about your experiment:*

1. Describe what happened when the vinegar was mixed with the baking soda.

2. What would be some reasons that we sealed the zipper baggie before we conducted the experiment?

3. Did the vinegar and baking soda undergo a chemical change or a physical change? How do you know?

4. How did your experiment support or fail to support the Law of Conservation of Mass?

5. How was your experiment different from the teacher demo in part A?

Expand: *Using the differences we noticed in question 5 above, change and recreate the teacher demo so that it proves the Law of Conservation of Mass.*

Planning:
Why did the teacher's demo fail to support the law of conservation of mass?

What part of the setup should be changed?

What are 3 possible ways to change the setup and fix the problem?
1.

2.

3.

Try It Out:

Describe Your Procedure Here:	Draw/Describe Your Setup Here:
Record Your Data Here:	Write a Conclusion Statement Here:

Blackline Master #2

Student Name _____

Checking for Understanding: Maintaining Matter

___ 1. During an experiment, Ashland noticed that the mass of the water in his beaker changed after the water was heated. Which of the following best describes what happened to the water in Ashland's experiment?

A. The total mass of the water in his beaker changed because the chemical composition of the water changed when he heated it.
B. The total mass of the water in his beaker changed because part of the water vaporized and is now in the air around the beaker.
C. The total mass of the water in his beaker changed because the water was destroyed when it was heated.
D. The total mass of the water in his beaker changed due to improper measurement techniques.

___ 2. The equation below shows the reaction that occurs when baking soda reacts with vinegar.

Baking Soda + Vinegar → Water + Carbon Dioxide + Sodium Acetate

Which of the following best compares the masses of the substances involved in this reaction

A. The mass of the vinegar equals the combined masses of the sodium acetate, water and carbon dioxide.
B. The mass of baking soda equals the combined masses of sodium acetate, water and carbon dioxide.
C. The combined masses of the vinegar and baking soda equal the combined masses of sodium acetate and water.
D. The combined masses of baking soda and vinegar equal the combined masses of sodium acetate, water and carbon dioxide.

___ 3. In a landfill, old biodegradable materials are breaking down while, at the same time, new trash is being added daily. Which statement best describes the relationship between a landfill and the mass of the earth?

A. The mass of the earth increases due to trash being added to the landfill
B. The mass of the earth decreases due to materials breaking down in the landfill
C. The mass of the earth remains the same regardless of the amount of trash in the landfill
D. The mass of the earth might increase or decrease, it all depends on the amount of trash.

___ 4. When new cities are built,

A. the mass of the earth increases.
B. the mass of the earth decreases.
C. the mass of the earth remains the same.

____ 5. As the earth's population expands,

A. the mass of the earth increases.
B. the mass of the earth decreases.
C. the mass of the earth remains the same.

Blackline Master #3: ANSWER KEYS

Student Name: _____ Period: _____ Date: _____

Law of Conservation of Mass Explained: *Sample Student Responses*

Engage: *After viewing the videos, tell me what you think:*

Time Lapse Construction:
When we build new cities,
A. the total mass of the earth decreases.
B. the total mass of the earth increases.
C. the total mass of the earth remains the same.
Why did you select this answer?
Student responses will vary

Time Lapse Plant Growth:
When new plants grow,
A. the total mass of the earth decreases.
B. the total mass of the earth increases.
C. the total mass of the earth remains the same.
Why did you select this answer?
Student responses will vary

Explore:
Part A: *Answer the following questions before, during, and after viewing the Teacher Demo.*

Pre-Demo: If I add together water and an Effervescent tablet tablet, will the total mass before mixing be less than, equal to or greater than the mass after mixing? *responses will vary*
Explain: *responses will vary but should indicate a rational reason why student has chosen this hypothesis*

Demo: Fill in the chart below while watching the demo:

Item	Mass Before Mixing	Mass After Mixing
Effervescent tablet Tablet		
100 mL Water*		
Erlenmeyer Flask		
Total Materials		

*Calculating the mass of the water	
Mass of container and water	
Mass of container	
Mass of water	

Post Demo: What do you notice about the numbers for the mass before and after mixing? How can you explain what you saw? *Student responses will vary but should indicate that the mass numbers at the beginning and ending of the experiment did not match and should provide a reasonable explanation of what was observed.*

Did the Effervescent tablet and water reaction demonstrate the law of conservation of mass? Why or why not? *Student responses will vary but students should be able to explain that the demo did NOT demonstrate the law of conservation of mass because the mass was not the same at the beginning and end so "matter was lost."*

How do you think you could change the experiment to demonstrate the law of conservation of mass? *Student responses will vary. Students may not be able to hypothesize yet how they could demonstrate the law of conservation of mass. Some students may be able to identify that gas was escaping the demonstration and that gases have mass. They may be able to identify that something needs to be changed so that the gas cannot escape.*

Explore:

Part B: *Using the materials provided and instructions listed below, conduct an experiment that will explain that the Law of Conservation of Mass is valid. Record your group measurements in the data table provided.*

Instructions:

1. Place 20 g of Baking Soda in a medicine cup and find its mass.
2. Place 20 mL of vinegar in a medicine cup and find its mass.
3. Find the mass of the vinegar and record the mass of the vinegar and baking soda in your table.
4. Record the masses of both in your data table.
5. Place both containers into the Zipper baggie bag without spilling the contents, remove as much air as possible from the bag, and tightly seal the bag.
6. Tip the cups over to mix the vinegar and baking soda together without opening the bag.
7. After all evidence of a reaction has stopped, find the final mass of all the contents within the bag (do not open the bag).

Item	Mass Before	Mass After
Vinegar & Cup		
Baking Soda & Cup		
Baggie		
Total		

Explain: *Answer the following questions about your experiment:*

1. Describe what happened when the vinegar was mixed with the baking soda.
   Student answers will vary but should include:
   1) bubbles were produced
   2) gas was released
2. What would be some reasons that we sealed the Zipper baggie bag before we conducted the experiment? *Student answers will vary but should include that closing the bag will trap the gas that was released from the reaction. Advanced or high school level students could also include information and terms related to closed systems.*
3. Did the vinegar and baking soda undergo a chemical change or a physical change? How do you know? *This experiment shows a chemical change. Bubbles appearing and the creation of a gas are both evidence of a new substance being formed. Chemical changes are defined as a change in matter that creates a new substance.*
4. How did your experiment demonstrate the conservation of mass? *The total mass of the bag, vinegar, baking soda, and measuring cups (all of the materials) was the same before and after the reaction*

5. How was your experiment different from the teacher demo in part A? *Student answers will vary but should include the fact that the teacher experiment allowed gas to be released into the room while the student experiment trapped the gas.*

Expand: *Using the differences we noticed in question 5 above, change and recreate the teacher demo so that it proves the Law of Conservation of Mass.*

Planning:
Why didn't the teacher demo show conservation of mass? *The teacher setup didn't have a way to trap the gas being produced, therefore there was no way to measure the mass of the gas.*

What part of the setup should be changed? *A baggie, balloon or some other container should be used to trap and measure the gas released from the experiment*

What are 3 possible ways to change the setup and fix the problem?
1. *Student answers will vary but should be aimed at a solution to capture and measure the gas produced.*
2.

3.

Try It Out:

Describe Your Procedure Here: *Student answers will vary in each of these sections. Student procedures and setups should be approved by the teacher before students are allowed to proceed with their independent experimentation.*	Draw/Describe Your Setup Here:
Record Your Data Here:	Write a Conclusion Statement Here:

Checking for Understanding: Maintaining Matter
Answer Key

___ 1. During an experiment, Ashland noticed that the mass of the water in his beaker changed after the water was heated. Which of the following best describes what happened to the water in Ashland's experiment?

A. The total mass of the water in his beaker changed because the chemical composition of the water changed when he heated it.
B. The total mass of the water in his beaker changed because part of the water vaporized and is now in the air around the beaker.
C. The total mass of the water in his beaker changed because the water was destroyed when it was heated.
D. The total mass of the water in his beaker changed due to improper measurement techniques.

___ 2. The equation below shows the reaction that occurs when baking soda reacts with vinegar.

Baking Soda + Vinegar → Water + Carbon Dioxide + Sodium Acetate

Which of the following best compares the masses of the substances involved in this reaction?

A. The mass of the vinegar equals the combined masses of the sodium acetate, water and carbon dioxide.
B. The mass of baking soda equals the combined masses of sodium acetate, water and carbon dioxide.
C. The combined masses of the vinegar and baking soda equal the combined masses of sodium acetate and water.
D. The combined masses of baking soda and vinegar equal the combined masses of sodium acetate, water and carbon dioxide.

___ 3. In a landfill, old biodegradable materials are breaking down while, at the same time, new trash is being added daily. Which statement best describes the relationship between a landfill and the mass of the earth?

A. The mass of the earth increases due to trash being added to the landfill
B. The mass of the earth decreases due to materials breaking down in the landfill
C. The mass of the earth remains the same regardless of the amount of trash in the landfill
D. The mass of the earth might increase or decrease, it all depends on the amount of trash.

___ 4. When new cities are built,

A. the mass of the earth increases.
B. the mass of the earth decreases.
C. the mass of the earth remains the same.

____ 5. As the earth's population expands,

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B. the mass of the earth decreases.
C. the mass of the earth remains the same.