Where Did It Go?

Use controlled trials and mass data to track a gas-producing reaction.

CHE.7.7 "Plan and conduct controlled scientific investigations to produce mathematical evidence that confirms that reactions involving gases conform to the law of conservation of mass."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline what the student keeps the same, circle what changes between the closed and open trials, and number the before and after mass readings for each trial. These marks will help you use the data to test whether mass is conserved.

A Fizzing Flask on the Balance

1. A student tests whether a fizzing reaction loses mass or only releases gas from view. Vinegar and baking soda react in a flask to produce carbon dioxide, water, and dissolved substances. Before mixing, the student records the total mass of the flask, a small cup of baking soda, vinegar, a balloon, and a tray.

2. For each trial, the student uses the same flask and tray, the same volume of vinegar, and the same mass of baking soda. A balloon is attached to the flask for the closed trials. For the open trial, the balloon lies on the tray instead. The student mixes the chemicals without removing anything from the balance.

3. The balloon expands in the closed trials as gas collects inside it. In the open trial, gas can travel into the room. Each mass reading includes the entire tray and everything on it. The student records the second reading after the fizzing stops. The balance reads to the nearest 0.01 g.

MASS READINGS FOR THREE TRIALS

Trial	Mass before mixing (g)	Mass after fizzing (g)
Closed A	152.36	152.35
Closed B	152.34	152.34
Open	152.36	151.75

2 ANSWER WITH EVIDENCE

Use the passage

1. Calculate the change in mass for each closed trial. State whether each reading increased, decreased, or stayed the same.

2. Calculate the open trial's change in mass. How does its size compare with the largest change in a closed trial?

3. What did the student change between the closed and open trials? Name two things kept the same and explain why keeping them the same matters.

4. Do the closed-trial numbers support conservation of mass? Use both closed trials as evidence, then explain why the open trial does not disprove the law.

3 YOUR TURN

Your own words

Plan a closed-flask follow-up using two different masses of baking soda and enough vinegar to react with both. Describe how you will trap the gas and control other conditions, then give plausible before and after mass readings for both trials and explain what they show.

Where Did It Go?

PART 1 · READ AND MARK

Underline what the student keeps the same, circle what changes between the closed and open trials, and number the before and after mass readings for each trial. These marks will help you use the data to test whether mass is conserved. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Calculate the change in mass for each closed trial. State whether each reading increased, decreased, or stayed the same.	**Closed A decreased by 0.01 g. Closed B stayed the same, with a change of 0.00 g.**
2	Calculate the open trial's change in mass. How does its size compare with the largest change in a closed trial?	**The open trial decreased by 0.61 g. That decrease is 0.60 g greater than the 0.01 g decrease in Closed A.**
3	What did the student change between the closed and open trials? Name two things kept the same and explain why keeping them the same matters.	**The student changed whether the balloon was attached, which determined whether gas could escape. The vinegar volume and baking soda mass stayed the same. This makes gas escape a more useful explanation for the difference in mass readings.**
4	Do the closed-trial numbers support conservation of mass? Use both closed trials as evidence, then explain why the open trial does not disprove the law.	**Yes. Closed A changed by only 0.01 g, and Closed B showed no change. In the open trial, carbon dioxide could leave the materials being weighed, so its lower final reading does not mean matter was destroyed.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I will attach a balloon to the flask to trap the gas. I will use 30 mL of vinegar in each trial, with 0.50 g of baking soda in Trial 1 and 1.00 g in Trial 2. I will keep the flask, tray, balloon, and measuring steps the same. Plausible readings are 160.25 g before and after Trial 1, and 160.75 g before and after Trial 2. Each trial shows no change in total mass, even though the amounts of baking soda differ.

Accept a 0.01 g difference in a proposed closed trial if the student recognizes that small reading differences are possible. The plan should trap the gas and compare before and after masses for each trial.