The Missing Mass

Test what happens to total mass when a reaction makes gas.

P.7.5E.1 "Conduct simple scientific investigations to show that total mass is not altered during a chemical reaction in a closed system. Compare results of investigations to Antoine-Laurent Lavoisier's discovery of the law of conservation of mass."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the before-and-after masses in each sealed trial, circle the words that show how the bag kept gas inside, and put a star next to the trial that let gas escape.

Bubbles in a Bag

1. A bag can become a tiny lab. Maya placed baking soda in one corner of a zipper bag and a small open cup of vinegar in the other. Without spilling either substance, she sealed the bag and weighed the entire setup. Then she tipped the cup inside the sealed bag. Bubbles swelled the bag.

2. For each trial, Maya weighed the whole setup before mixing and after the bubbling stopped. She kept the bag sealed for two trials. In a third trial, she used an unzipped bag so gas could leave. The amounts of vinegar and baking soda were the same in trials A and C.

MASS OF THE WHOLE SETUP

Trial	Bag	Before (g)	After (g)
A	Sealed	125.4	125.4
B	Sealed	126.1	126.1
C	Unzipped	125.4	124.7

3. In the late 1700s, Antoine-Laurent Lavoisier measured substances before and after chemical reactions in closed containers. He found that total mass stayed the same although the substances changed. His work helped establish the law of conservation of mass: matter is not created or destroyed during a chemical reaction. Escaping gas is matter, too.

2 ANSWER WITH EVIDENCE

Use the passage

1. In trial A, did the total mass change after the reaction? Use both measurements in your answer.

2. Trials A and B started at different masses. What pattern do their results show for sealed bags?

3. Trial C measured 0.7 g less afterward. Why does this result not show that matter was destroyed?

4. How do Maya's sealed trials compare with Lavoisier's finding?

3 YOUR TURN

Your own words

Design a new closed-system test with vinegar and baking soda, using a plastic bottle and a balloon instead of a bag. In three sentences, describe how you will keep gas from escaping, give a possible before-and-after mass, and compare your predicted result with Lavoisier's finding.

ANSWER KEY

The Missing Mass

GRADE 7 · P.7.5E.1

PART 1 · READ AND MARK

Underline the before-and-after masses in each sealed trial, circle the words that show how the bag kept gas inside, and put a star next to the trial that let gas escape. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In trial A, did the total mass change after the reaction? Use both measurements in your answer.	**No. The whole setup measured 125.4 g both before and after the reaction.**
2	Trials A and B started at different masses. What pattern do their results show for sealed bags?	**Each sealed bag had the same total mass before and after its reaction.**
3	Trial C measured 0.7 g less afterward. Why does this result not show that matter was destroyed?	**The bag was unzipped, so some gas could escape. That gas was no longer included in the mass measured afterward.**
4	How do Maya's sealed trials compare with Lavoisier's finding?	**Both show that the total mass stays the same during a chemical reaction in a closed system.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would put vinegar in a plastic bottle and baking soda in a balloon, attach the balloon tightly, and weigh the entire setup before tipping in the powder. If the setup starts at 150.0 g, I predict it will still be 150.0 g after the reaction. This would agree with Lavoisier's finding because the balloon traps the gas.

Accept any plausible matching before-and-after masses for a sealed setup. The plan must include the balloon and its contents in both measurements.