Atoms Stay Accounted

Use particle models to track matter through chemical change.

MS-PS1-5 "Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. Clarification Statement: Emphasis is on law of conservation of matter, and on physical models or drawings..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline every statement that tells what stays the same before and after a reaction. Circle every statement that tells how a particle model can show that idea.

A Reaction, Rearranged

1. When vinegar and baking soda react in a sealed bag, the bag may puff up as carbon dioxide gas forms. The materials change, but the atoms are not created or destroyed. Before the reaction, atoms are arranged in vinegar and baking soda. Afterward, those same atoms are arranged in new substances, including gas, water, and a dissolved substance. A chemical reaction is like rebuilding with the same set of blocks. The groups change, yet the total number of each kind of atom stays the same.

2. A particle model can show this idea without formulas or mass numbers. Use one color or shape for each kind of atom, and make a key that tells what each symbol means. Draw the particles before the reaction on one side and the particles after the reaction on the other. Count each kind of atom in both drawings. If each count matches, the model shows conservation of matter. The atoms may be connected in different groups after the reaction. Empty space between particles can show a gas, but empty space is not matter.

3. Mass is conserved because mass depends on the matter in a system. In a sealed container, no atoms can leave or enter during the reaction, so the total mass before and after should be equal. If a reaction happens in an open cup, a gas can escape into the room. The cup and its contents may then have less mass, even though matter has not vanished. To investigate fairly, include the container and every product when comparing mass. A complete particle model helps explain where atoms are.

2 ANSWER WITH EVIDENCE

Use the passage

1. What must match in the before-and-after sides of a particle model for the model to show conservation of matter?

2. A model shows gas after a reaction. How can the model show the gas without adding a new kind of matter?

3. A reaction takes place in a sealed container. Predict how the total mass after the reaction compares with the total mass before it, and explain why.

4. A reaction in an open cup has a lower measured mass afterward because gas escaped. Does this show that matter was destroyed? Explain.

3 YOUR TURN

Your own words

On blank space, create a before-and-after particle model for a reaction in a sealed container. Use circles for one kind of atom and triangles for another, with exactly 6 circles and 4 triangles on each side, but connect the atoms in different groups after the reaction. Include a key and write exactly two sentences explaining how your model shows conservation of matter.

ANSWER KEY

Atoms Stay Accounted

GRADES 6-8 · MS-PS1-5

PART 1 · READ AND MARK

Underline every statement that tells what stays the same before and after a reaction. Circle every statement that tells how a particle model can show that idea. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What must match in the before-and-after sides of a particle model for the model to show conservation of matter?	**The number of each kind of atom must match on both sides.**
2	A model shows gas after a reaction. How can the model show the gas without adding a new kind of matter?	**It can show more empty space between the particles. Empty space is not matter.**
3	A reaction takes place in a sealed container. Predict how the total mass after the reaction compares with the total mass before it, and explain why.	**The total mass should be equal because no atoms can enter or leave the sealed container.**
4	A reaction in an open cup has a lower measured mass afterward because gas escaped. Does this show that matter was destroyed? Explain.	**No. Matter was not destroyed. Gas escaped into the room, so it was not included in the cup's measured mass.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Key: circles are blue atoms and triangles are yellow atoms; before, draw two connected groups of circle-circle-triangle-triangle and one connected circle-circle group, and after, draw two connected circle-triangle-circle groups, one circle-circle group, and one triangle-triangle group. Both drawings have six blue atoms and four yellow atoms, so the sealed-container reaction conserves matter even though the atoms are connected differently.

Accept models with any valid grouping, as long as each atom type has the same count before and after and the key is clear. The two explanation sentences should state matching atom counts and explain that rearrangement does not create or destroy matter.