

Matter Stays Put

Use mass to track matter in closed and open systems.

GRADE 5 • TEKS 5.5

5.5 "Recurring themes and concepts. The student understands that recurring themes and concepts provide a framework for making connections across disciplines..."

NAME _____

DATE _____

TRACK THE TOTAL MASS

In a closed system, no matter enters or leaves, so the total mass stays the same even when matter changes form. Add the masses of parts to find a total, or subtract a known part from the total to find a missing mass.

WORKED EXAMPLE

A sealed container holds 16 g of liquid and 9 g of powder before they react. What is the total mass after the reaction?

1. Add the masses of the two parts.
2. $16\text{ g} + 9\text{ g} = 25\text{ g}$.
3. The container is sealed, so no matter leaves.

Answer: 25 g

PRACTICE 6 problems

- 1** A sealed cup contains 31 g of liquid and 22 g of powder before a reaction. What is the total mass after the reaction?

ANSWER _____

- 2** A sealed container has a total mass of 64 g after a reaction. One product has a mass of 29 g. What is the mass of the other product?

ANSWER _____

- 3** A sealed bottle has a mass of 47 g before water evaporates inside it. Its mass is still 47 g after the water evaporates. What does this show about matter entering or leaving the bottle?

ANSWER _____

- 4** An open cup holds materials with a total mass of 52 g before a bubbly reaction. After the reaction, the materials in the cup have a mass of 46 g. No material entered the cup. How much mass likely left the cup as gas?

ANSWER _____

- 5** A sealed terrarium has a mass of 85 g. Some water inside evaporates and later condenses on the lid. What is the mass of the terrarium after the water condenses?

ANSWER _____

- 6** A sealed model pond contains 74 g of water, 13 g of sand, and 8 g of plants. What is the total mass of the materials in the model pond?

ANSWER _____

APPLY IT Show your work

- 1** For a science fair project, Maya puts 126 g of vinegar and 38 g of baking soda into a strong sealed bag. After the reaction, the bag contains 149 g of liquid and foam. How many grams of gas are inside the sealed bag?

WORK SPACE

ANSWER _____

- 2** A school garden group places 215 g of leaves and 47 g of food scraps into a sealed decomposition chamber. Later, the chamber contains 181 g of compost and 54 g of water. How many grams of gas are in the chamber?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two teams each begin a bubbly reaction with 96 g of materials. Team A uses a sealed bag, and the bag still has a mass of 96 g after the reaction. Team B uses an open cup, and the materials left in the cup have a mass of 88 g. Liam says that Team B destroyed 8 g of matter. Is Liam correct? Explain what likely happened to the 8 g.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A sealed cup contains 31 g of liquid and 22 g of powder before a reaction. What is the total mass after the reaction?	53 g
2	A sealed container has a total mass of 64 g after a reaction. One product has a mass of 29 g. What is the mass of the other product?	35 g
3	A sealed bottle has a mass of 47 g before water evaporates inside it. Its mass is still 47 g after the water evaporates. What does this show about matter entering or leaving the bottle?	No net matter entered or left the bottle. The water changed form, but it stayed inside the sealed system.
4	An open cup holds materials with a total mass of 52 g before a bubbly reaction. After the reaction, the materials in the cup have a mass of 46 g. No material entered the cup. How much mass likely left the cup as gas?	6 g
5	A sealed terrarium has a mass of 85 g. Some water inside evaporates and later condenses on the lid. What is the mass of the terrarium after the water condenses?	85 g
6	A sealed model pond contains 74 g of water, 13 g of sand, and 8 g of plants. What is the total mass of the materials in the model pond?	95 g

PART 2 • APPLY IT

- 15 g** The starting mass is $126\text{ g} + 38\text{ g} = 164\text{ g}$. Subtract 149 g of liquid and foam: $164\text{ g} - 149\text{ g} = 15\text{ g}$ of gas.
- 27 g** The starting mass is $215\text{ g} + 47\text{ g} = 262\text{ g}$. The compost and water total $181\text{ g} + 54\text{ g} = 235\text{ g}$, so $262\text{ g} - 235\text{ g} = 27\text{ g}$ of gas.

CHALLENGE

No. Team B's cup was open, so 8 g of matter likely left the cup as gas. The matter was not destroyed, it moved outside the measured system.

Accept "g" or "grams" for numerical answers. For written responses, accept equivalent explanations that identify the system boundary and explain that matter can leave an open system but is conserved overall.