

# Fixing Priya's Notebook: Six Mistakes About Atoms and Elements

**Learning target:** I can find the errors in another student's statements about atoms, elements, matter and the periodic table, explain why each is wrong, and rewrite it correctly.

Error analysis

About 35 min

Individual

MS-PS1-1 · supports

writing

independent practice

Name \_\_\_\_\_

Date \_\_\_\_\_

Period \_\_\_\_\_

## Directions

Priya wrote eight statements in her science notebook after Lesson 1. Six of them contain a mistake and two are correct. Your job is to be the teacher. First, mark every statement as correct or incorrect in the table. Then, for each incorrect statement, explain what went wrong in Priya's thinking and rewrite the statement so that it is true. Be specific: 'that's wrong' is not an explanation.

**You will need:** This worksheet, Pencil

**Priya's notebook (copied exactly)** — **1.** Atoms are really small, but if you use a strong enough magnifying glass you can see them. **2.** An element is one atom. A gold ring is one element made of many atoms, so each atom in the ring is also an element. **3.** Air is not matter because it has no mass and you cannot see it; that is why a balloon full of air feels like it weighs nothing. **4.** Lithium, beryllium and boron are in the same row, so they have the same properties. **5.** Mendeleev left empty spaces in his table because he made mistakes and had to fix them later. **6.** Atomic mass is different for every atom, so an atom of oxygen could easily have the same mass as an atom of sulfur. **7.** Scientists use picometers to describe atoms because a meter is far too big a unit for something on the atomic scale. **8.** The symbol for sodium is Na because it comes from the Latin name natrium, not from the English name.

Part A: Diagnose

1. Complete the table. For each incorrect statement, name in a few words the word or idea Priya got wrong.

| Correct or incorrect? | The word or idea that went wrong (a few words) |
|-----------------------|------------------------------------------------|
| Statement 1           |                                                |
| Statement 2           |                                                |
| Statement 3           |                                                |
| Statement 4           |                                                |
| Statement 5           |                                                |
| Statement 6           |                                                |
| Statement 7           |                                                |
| Statement 8           |                                                |

Part B: Explain and rewrite

For each incorrect statement, write two things: (a) **What went wrong**: the mistaken idea behind the statement, and (b) **Rewrite**: the statement corrected so that it is scientifically true.

2. Statement 1 (magnifying glass). (a) What went wrong? (b) Rewrite it. In your rewrite, say what kind of tool did finally let scientists map individual atoms.

3. Statement 2 (an element is one atom). (a) What went wrong? (b) Rewrite it so that the words atom and element are each used correctly.

4. Statement 3 (air is not matter). (a) What went wrong? (b) Rewrite it, and include one piece of evidence from this lesson that air has mass.

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5. Statement 4 (same row, same properties). (a) What went wrong? (b) Rewrite it using the words group and period correctly.

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6. Statement 5 (Mendeleev's empty spaces). (a) What went wrong? (b) Rewrite it, and name one element that was later found to fill a space.

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7. Statement 6 (oxygen could weigh as much as sulfur). (a) What went wrong? (b) Rewrite it using the atomic masses of oxygen (16 Da) and sulfur (32 Da).

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## Part C: Step back

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8. Statements 2 and 6 are both about the difference between one atom and a whole element. Write one sentence Priya could tape inside her notebook cover that would stop her from making both mistakes again.
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- \_\_\_\_\_
- \_\_\_\_\_
9. Statements 7 and 8 are correct. Pick one and explain why it is correct, as if Priya had asked you to check it.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

### The 'because' test

A statement usually goes wrong at the word 'because' or 'so.' Underline that word in each of Priya's statements and ask: does the first half really lead to the second half? For statement 3, for example, 'you cannot see it' does not lead to 'it has no mass'; lots of things you cannot see have mass. Finding the broken link is the 'what went wrong' part of your answer.

### Write the tricky ninth statement

Statement 6 hides a real subtlety. This lesson treats every atom of an element as having the same atomic mass, but the number on the periodic table is actually an average: atoms of one element can differ very slightly in mass (scientists call these variations isotopes), though never enough to match a different element. Write a ninth statement for Priya's notebook that is true at this lesson's level AND true at the more advanced level, then explain in two sentences what you had to leave out to keep it accurate for both.