

Atom Count Check

Use balanced equations to track matter through chemical change.

PS.3.d "balanced chemical equations model the conservation of matter."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB For each printed equation, write the number of atoms of each element above both sides, then circle the equations whose atom totals match.

Atoms Before and After

- ① Chemical equations are models, not just recipe lists. They show which atoms are present before and after a reaction. In a hydrogen fuel cell, hydrogen and oxygen form water. The balanced equation is $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$. On each side, there are four hydrogen atoms and two oxygen atoms. These matching totals show that atoms were rearranged into water molecules, not created or destroyed. The equation models conservation of matter during the reaction. It also makes the invisible particle changes easier to track.
- ② Small numbers written low in a formula are subscripts. A subscript tells how many atoms are in one molecule or formula unit. It is part of the substance's identity. For example, H_2O has two hydrogen atoms in each water molecule. A coefficient, written in front, multiplies every atom in the formula. In $2\text{H}_2\text{O}$, the coefficient 2 means two water molecules, for four hydrogen atoms and two oxygen atoms. Changing a subscript would name a different substance, so balance equations by changing coefficients only.
- ③ Magnesium burns with a bright white light when it reacts with oxygen. Its balanced equation is $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$. The reactant side contains two magnesium atoms and two oxygen atoms. The product side has the same totals in two units of magnesium oxide. Matter may change state, temperature, or chemical form during a reaction, but the count of each kind of atom remains the same in a balanced equation. Checking element by element helps scientists test whether an equation correctly models the reaction.

2 ANSWER WITH EVIDENCE Use the passage

1 What are the hydrogen and oxygen atom totals on each side of $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$?

2 Using the passage's rule for coefficients, how many hydrogen atoms and oxygen atoms are represented by $3\text{H}_2\text{O}$?

3 Why should you change coefficients, rather than subscripts, when you balance an equation?

4 Explain how $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ models conservation of matter.

3 YOUR TURN Your own words

Balance this equation using whole-number coefficients: $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$. Then write one sentence that compares the atom totals on both sides.

PART 1 • READ AND MARK

For each printed equation, write the number of atoms of each element above both sides, then circle the equations whose atom totals match. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What are the hydrogen and oxygen atom totals on each side of $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$?	Each side has 4 hydrogen atoms and 2 oxygen atoms.
2	Using the passage's rule for coefficients, how many hydrogen atoms and oxygen atoms are represented by $3\text{H}_2\text{O}$?	$3\text{H}_2\text{O}$ represents 6 hydrogen atoms and 3 oxygen atoms.
3	Why should you change coefficients, rather than subscripts, when you balance an equation?	A subscript is part of a substance's identity. Changing it would make a different substance, while a coefficient changes the number of particles.
4	Explain how $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ models conservation of matter.	It has 2 magnesium atoms and 2 oxygen atoms on both sides. The atoms are rearranged into magnesium oxide, not created or destroyed.

PART 3 • YOUR TURN (SAMPLE ANSWER)

$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ Both sides have 1 carbon atom, 4 hydrogen atoms, and 4 oxygen atoms.

Accept equivalent correctly balanced equations with a coefficient of 1 omitted. The explanation should compare all three element totals and state or clearly show that they match.