

Equation Detectives

Use chemical equations to model a chemical change.

6.5.f "chemical equations can be used to model chemical changes; and"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB In the equation in the passage, underline each reactant, circle each product, and box each coefficient to show how the equation models the chemical change.

A Model of Burning Methane

- ① Chemical changes make new substances. Chemists use chemical equations as short models of these changes. A reactant is a starting substance, written on the left side of an arrow. A product is a substance made during the change, written on the right. The arrow means "yields" or "makes," not "equals." In the equation $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$, methane and oxygen are reactants. Carbon dioxide and water are products. This equation models methane burning in oxygen. The small numbers show atoms in each formula.
- ② An equation must show the same number of each kind of atom before and after a chemical change. Matter is not created or destroyed in an ordinary chemical reaction. Chemists balance an equation by placing whole-number coefficients in front of formulas. A coefficient multiplies every atom in the formula after it. In the methane equation, the coefficient 2 before O_2 represents four oxygen atoms. The coefficient 2 before H_2O represents two water molecules, with four hydrogen atoms and two oxygen atoms total.
- ③ Subscripts and coefficients have different jobs. A subscript is a small number inside a formula. It tells how many atoms of one element are in one unit of that substance. For example, the 3 in NH_3 means one ammonia molecule has three hydrogen atoms. Do not change subscripts when balancing, because that would name a different substance. Check each element on both sides after adding coefficients. A balanced equation is a model that shows which substances changed and that atoms were rearranged, not lost.

2 ANSWER WITH EVIDENCE Use the passage

1 What does the arrow in a chemical equation mean?

2 Name the reactants and the products in the methane equation.

3 How many oxygen atoms does 2O_2 represent? Explain how you know.

4 Why should you not change a subscript when balancing an equation?

3 YOUR TURN Your own words

Magnesium reacts with oxygen to form magnesium oxide. Use $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$ to write a balanced chemical equation, then write one sentence telling how you checked that it is balanced.

PART 1 • READ AND MARK

In the equation in the passage, underline each reactant, circle each product, and box each coefficient to show how the equation models the chemical change. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What does the arrow in a chemical equation mean?	It means "yields" or "makes."
2	Name the reactants and the products in the methane equation.	The reactants are methane and oxygen. The products are carbon dioxide and water.
3	How many oxygen atoms does 2O_2 represent? Explain how you know.	It represents four oxygen atoms. The coefficient 2 multiplies the two oxygen atoms in each O_2 formula.
4	Why should you not change a subscript when balancing an equation?	Changing a subscript would name a different substance.

PART 3 • YOUR TURN (SAMPLE ANSWER)

$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$. I checked that both sides have two magnesium atoms and two oxygen atoms.

Accept an equation with coefficients 2, 1, and 2, with or without writing the coefficient 1. The checking sentence should state that each side has two magnesium atoms and two oxygen atoms.