

Warm-Up

Writing and Balancing
Chemical Equations

Lesson Objectives

By the end of this lesson, you should be able to:

- Describe chemical reactions by writing **word** equations and **formula** equations.

- Use the law of conservation of mass to **balance** chemical equations.

⚗ **Science Practice:** Identify and use special symbols properly in chemical equations.

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2K

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

chemical equation	a group of chemical formulas and symbols that represent the reactants and products in a chemical reaction
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Lesson
Question

What is the proper method for writing and balancing chemical equations?

Writing chemical equations:

- Words

- **Formulas**

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Word Equations

Components of a chemical equation include:

- **reactants**, which are the substances that enter into a chemical reaction.

Hydrogen + nitrogen → ammonia

- **products**, which are the substances that form.

A **chemical equation** is a group of chemical formulas and **symbols** that represent the reactants and products in a chemical reaction.

Instruction

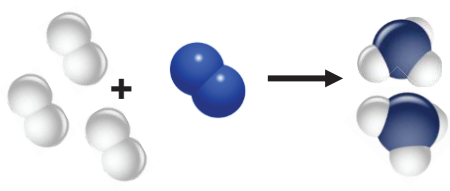
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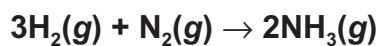
Formula Equations

Fill in this table with the type of equation shown.

model	
word	hydrogen + nitrogen → ammonia
formula	$3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$

Coefficients

- A chemical formula shows how many atoms go into a reaction. A chemical formula also shows what the reactants form .
- A coefficient is the number in front of the molecule. It represents the number of molecules in the equation.



Record the number of each type of molecule in the equation shown.

3	H_2
2	NH_3
1	N_2

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States of Matter

A chemical formula can also show the state of matter of the reactants and products.

- Matter in a gas state is represented by a **g**.
- Matter in a solid state is represented by an **s**.
- Matter dissolved in a liquid state is represented by an **aq**.
- Matter in a liquid state is represented by an **l**.

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Symbols in Chemical Equations

Symbols provide more information about reactions.

- State symbols are added **after** formulas.
- Reaction conditions are added **above** the arrow.
- **Catalysts** are added above the arrow because they are not used up.

Symbol	Meaning
(s)	Solid
(l)	Liquid
(g)	Gas
(aq)	Aqueous
\leftrightarrow	Reversible reaction
$\xrightarrow{\Delta}$	Heated
$\xrightarrow{25^{\circ}\text{C}}$	Temperature of reaction
$\xrightarrow{2\text{ atm}}$	Pressure of reaction
$\xrightarrow{\text{Pt}}$	Catalyst used

Instruction

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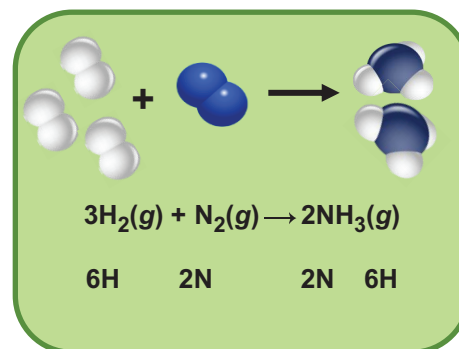
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Balanced Equations

Balanced chemical equations:

- have the same types of **atoms** on both sides of equations.
- have the **same** number of each type of atom.
- show **conservation** of mass.



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How to Balance Equations

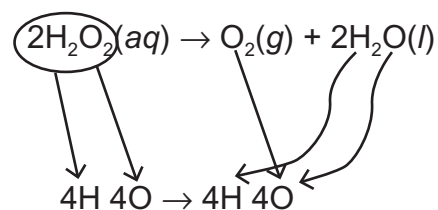
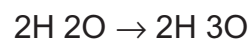
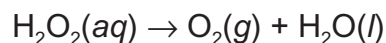
When you balance a chemical equation:

Write the **formula** equation.

Count each type of atom.

Use **coefficients** to balance.Count **atoms** again.

Reactant Product



Instruction

Writing and Balancing
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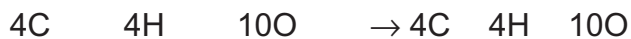
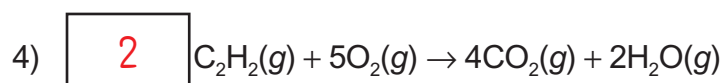
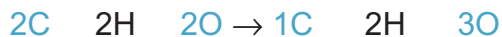
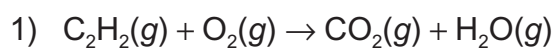
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Balancing Atoms

Acetylene, $C_2H_2(g)$, burns in oxygen to produce O_2 carbon dioxide CO_2 and water. H_2O

What is the balanced chemical equation for this reaction?



Summary

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Chemical Equations

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Lesson
Question

What is the proper method for writing and balancing chemical equations?

✓

Answer

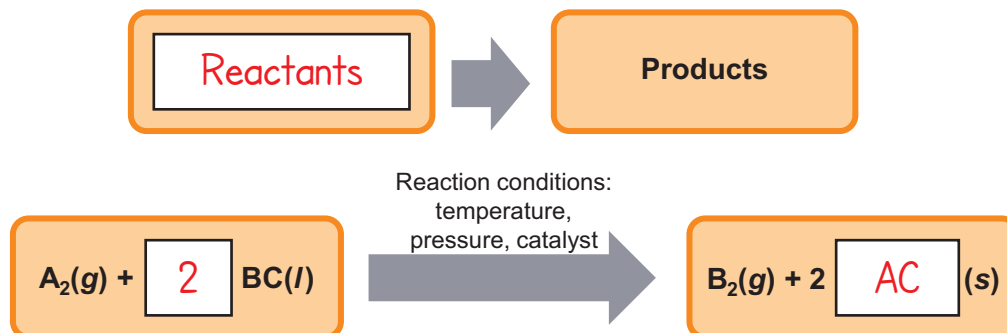
(Sample answer) In the proper method of writing and balancing chemical equations, first, describe chemical reactions by writing word equations and formula equations. Secondly, use the law of conservation of mass to balance chemical equations.

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How to Write a Chemical Equation

Chemical equations use chemical formulas and symbols to represent chemical reactions.



Summary

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How to Balance a Chemical Equation

- Balanced chemical equations show the conservation of mass.
- The **numbers** and types of atoms in the products and reactants are the same.

Count each type of atom in the formula equation.

Use coefficients to
balance
one type of atom.

Count atoms again.

Use this space to write any questions or thoughts about this lesson.