

Balancing Chemical Equations

64 Worked Examples from Easy to Advanced

A beginner-friendly illustrated guide with practice questions, answers, cheat sheets and step-by-step methods

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Updated Table of Contents

Original chapters keep their printed page numbers. The new **Bonus Section** (chapters 16–21, marked NEW) sits after Chapter 15 and before About the Author; its pages are numbered separately.

No.	Chapter	Page
1	Welcome to the World of Chemical Equations	4
2	Atoms, Elements and Compounds	6
3	Reactants and Products	8
4	The Law of Conservation of Mass	10
5	Coefficients vs. Subscripts	12
6	What Does “Balancing” Mean?	14
7	Step-by-Step Methods for Balancing	16
8	Types of Chemical Reactions	18
9	Easy Examples (1–15)	20
10	Intermediate Examples (16–35)	26
11	Advanced Examples (36–56)	32
12	Common Mistakes and How to Avoid Them	39
13	Quick-Reference Tables and Cheat Sheets	40
14	Answers and Explanations	42
15	Summary, Key Takeaways and Glossary	44
16	Real-World Chemistry (Examples 57–64) NEW	Bonus 1
17	From Balanced Equations to Real Amounts NEW	Bonus 4
18	Ionic Equations and Redox Balancing NEW	Bonus 6
19	Exam Strategy and a 4-Week Study Plan NEW	Bonus 8
20	Bonus Practice Set 5 with Answers NEW	Bonus 9
21	Frequently Asked Questions NEW	Bonus 11
	About the Author	45
	Get Your Copy (final page)	—

01

Welcome to the World of Chemical Equations

Chemistry has its own short, powerful language

Every time you strike a match, bake a cake, charge a phone or breathe, atoms are being rearranged into new substances. Chemists describe these changes with **chemical equations**: short statements that tell you what you start with, what you end up with, and how much of each is involved.

Think of a chemical equation as a recipe. A cake recipe says "2 eggs + 200 g flour → 1 cake". A chemical equation says " $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ ". Both list the ingredients, the amounts, and the result. The big difference is that chemistry has one strict rule: **no atom may disappear or appear out of nowhere**. Balancing is how we respect that rule.

What is a chemical equation?

A chemical equation uses symbols and formulas to describe a chemical reaction. The substances on the left of the arrow are the **reactants** (what you start with). The substances on the right are the **products** (what you get). The arrow means "yields" or "produces".

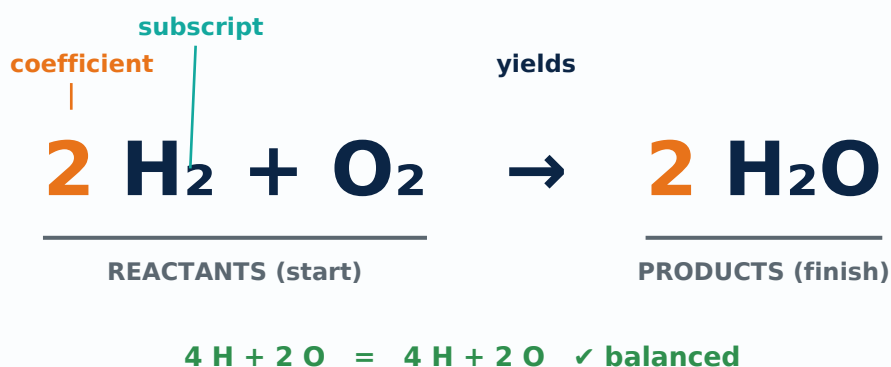


Figure 1. The parts of a balanced chemical equation: coefficients, subscripts, reactants, the yield arrow and products.

❄ Key idea

A chemical equation is a sentence in the language of chemistry. Once you can read and balance it, you can describe any reaction in the world, from rusting nails to growing plants.

How do we know a reaction happened?

A chemical reaction makes new substances with new properties. Chemists look for clues: bubbles of gas, a colour change, a solid forming in a clear liquid, or heat and light being given off. None of these clues is a perfect proof on its own (boiling water also makes bubbles!), but together they point towards a reaction.

09

Easy Examples (1-15)

Warm up with short, friendly equations

Start with the easier examples. For each one, try balancing it yourself before reading the explanation.

★ **Pro tip**

Each example below shows the balanced equation, a short reasoning note, and an atom tally table that proves it.

Example 1 SYNTHESIS · EASY



Oxygen comes in pairs (O_2), so two O atoms on the left need 2 H_2O on the right. That makes 4 H, so we need 2 H_2 . Hydrogen burning in oxygen makes only water.

Atom	H	O
Left	4	2
Right	4	2

✓ Every element has the same count on both sides.

Example 2 SYNTHESIS · EASY



The Haber process makes ammonia from nitrogen and hydrogen. N_2 holds 2 N, so make 2 NH_3 . That needs 6 H, which comes from 3 H_2 .

Atom	N	H
Left	2	6
Right	2	6

✓ Every element has the same count on both sides.

UPDATED EDITION

Make This Book Part of Your Study Routine

You have seen what is inside: **64 worked examples, 58 practice questions with answers, four balancing methods, cheat sheets, exam tactics and extra chapters on moles, limiting reactants, ionic equations and redox.** It is designed to take a beginner to confident, accurate balancing, and to stay useful as a reference long after the first read.

Three reasons to get your own copy

- **Save time:** one organized guide instead of dozens of scattered web pages.
- **Gain confidence:** a method that works on every equation, proven by the tally table each time.
- **Be exam-ready:** practice, answers, mistakes to avoid and a 4-week plan in one place.

Get your copy today

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Thank you for learning with Science Spherex. Keep experimenting, keep counting atoms, and keep asking why.