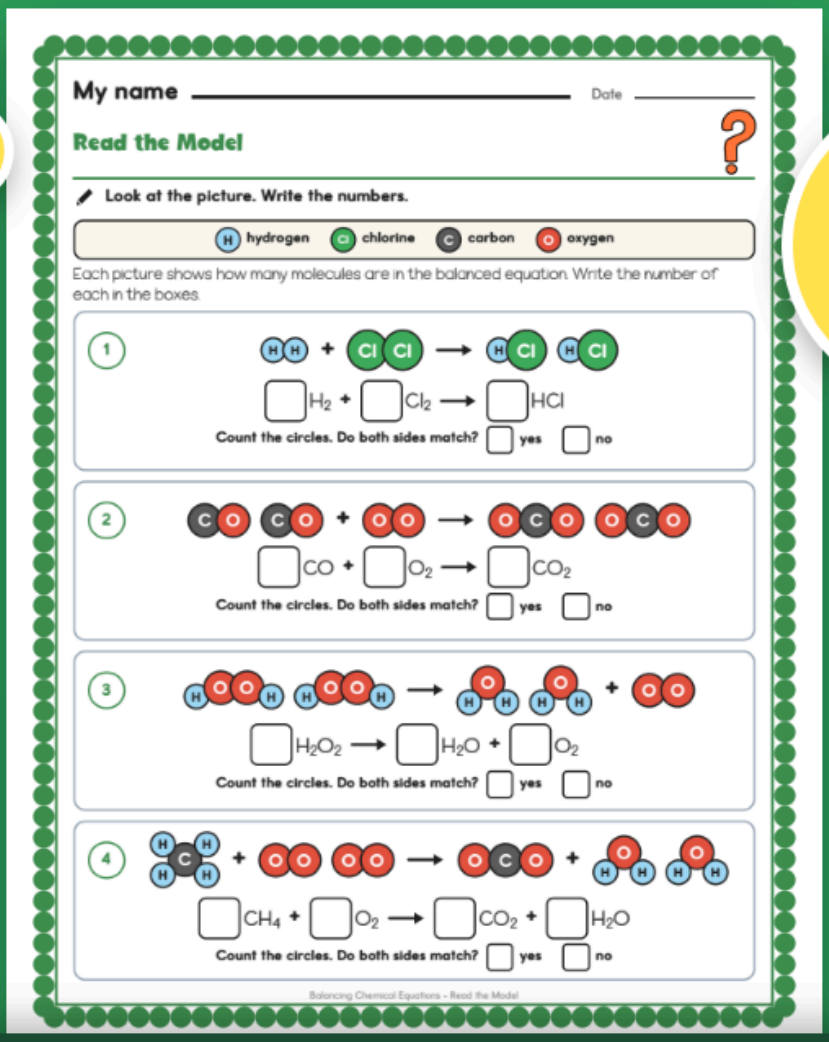
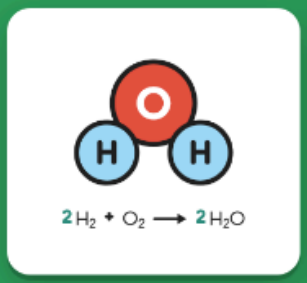
Bright Path Sped

77 ITEMS

40 PAGES





BALANCING CHEMICAL EQUATIONS

CONSERVATION OF MASS

GRADES 8-10

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- Every name line, coefficient box, atom-count cell, ruled box and check box on the student pages is a type-in field, and so are the tracker, class grid, team note and family page. You can also print any page and write by hand.
- It works offline. No account, no subscription, no internet connection needed after you download it.

Print at 100 percent

Turn off fit to page and shrink to fit so the ruled lines stay 0.34 inch apart. Every student page reads when copied in black and white; the atom circles print as gray.

Student work

A filled-in tracker, class grid or team note carries a real student's name. Keep it in the data folder, and use a first name only on any page that leaves your hands.

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PREVIEW

Preview · Bright Path Sped

Teacher Notes

The parts of a student page, the page types in order, and a few teaching notes.

The parts of a page

- **The coefficient box.** A bordered box in front of a formula. Click it to type, or print and write in it.
- **The atom-count table.** One column for each kind of atom, one row for each side. Count after you choose the coefficients; the rows must match.
- **The ruled work box.** Lines 0.34 inch apart for showing thinking, one idea to a line.
- **The check box.** Balanced or not yet; yes or not yet: click or mark one.
- **The cut line.** Six pieces in a 3 by 2 grid, each 2.4 by 1.25 inches, edge to edge: two cuts across and two down.

Page type	What it looks like	What the student does
Parts, Words, Count the Atoms	3 pages	Reactants, products, coefficient, subscript, conservation of mass, counting.
How to Balance, Worked, Your Turn	5 pages	A five-step chart, two worked examples with atom tables, two guided copies.
Balance It 1A to 3B	6 pages, 24 equations	Coefficient boxes and an atom table on every problem. Simple, building, ready for more.
Read the Model, Draw the Model	2 pages, 7 models	Count molecules in a picture; draw atoms in boxes.
Find the Mistake	2 pages, 6 problems	An invented student's work has one mistake. Find it and fix it.
Words to Equations, Mixed Review	2 pages, 7 equations	Turn words into an equation; a mixed set.
Cut and Paste 1 to 3	3 pages, 18 pieces	Balanced or not; match the coefficient list; match the atom count.

Three steps up, marked by a shape

- **Circle, starting (pages 13 and 14).** Two or three kinds of atom, short formulas, one or two formulas on each side.
- **Square, building (pages 15 and 16).** Burning carbon compounds, metals with acids, and a splitting compound. Three kinds of atom.
- **Triangle, ready for more (pages 17 and 18).** Groups in parentheses and longer equations with up to five kinds of atom.

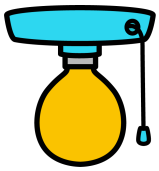
Teaching notes

- Say it every day: **coefficients change, subscripts never do.** Changing a subscript makes a different substance.
- Atoms are counted, not guessed. The table makes the count visible, so a student can point to the atom that is off.
- Atoms that appear in only one formula on each side are the easiest place to start. Save H and O for last when they appear in more than one place.
- A group in parentheses, like (OH) or (SO_4), can be counted as a unit when it is the same on both sides.
- Pages 21 and 22 show common slips from an invented student. Use them as a discussion, not a score.

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

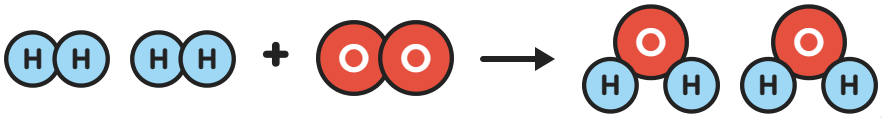


Parts of an Equation

Read about the parts of an equation.

Reactants → Products

$$2H_2 + O_2 \rightarrow 2H_2O$$



The same equation drawn as atoms. Count the circles on each side.

Coefficient
The big number in front of a formula. It multiplies every atom in it. 2 H_2O means 2 water molecules: 4 H atoms and 2 O atoms.

Subscript
The small low number inside one formula. It counts atoms in **one** molecule. H_2O has 2 H and 1 O. **Never change a subscript** to balance.

Law of Conservation of Mass. In a chemical reaction, atoms are not created or destroyed. They only move into new groups. So each kind of atom has the same count on both sides.

Balanced means the same count of every kind of atom on the left and the right.

Count in the picture. H **left** ☐ **right** ☐ O **left** ☐ **right** ☐

In your own words: why must the atoms match on both sides?

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Count the Atoms

Count the atoms. Write each number.

The big number multiplies every atom in the formula. Atoms inside parentheses are multiplied too.

1. $2MgO$ has Mg ☐ O ☐
2. $3CO_2$ has C ☐ O ☐
3. $4NH_3$ has N ☐ H ☐
4. $3Mg(NO_3)_2$ has Mg ☐ N ☐ O ☐
5. $2Fe_2O_3$ has Fe ☐ O ☐
6. $2Al(OH)_3$ has Al ☐ O ☐ H ☐

Show how you counted one of them.

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Worked Example 1

Read how it is done. Follow along.

Example. Balance $N_2 + H_2 \longrightarrow NH_3$ The equation is a standard one; the steps are the same for any equation.

Start. Count the atoms in the skeleton equation.

$N_2 + H_2 \longrightarrow NH_3$

Atoms	N	H
Left side	2	2
Right side	1	3

Step 1. Balance N. The left side has 2 N and the right side has 1 N. Put a 2 in front of NH_3.

$N_2 + H_2 \longrightarrow 2\,NH_3$

Atoms	N	H
Left side	2	2
Right side	2	6

Step 2. Balance H. The left side has 2 H and the right side has 6 H. Put a 3 in front of H_2.

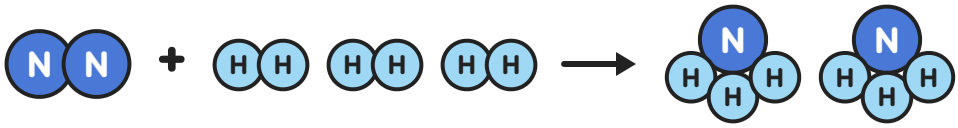
$N_2 + 3\,H_2 \longrightarrow 2\,NH_3$

Atoms	N	H
Left side	2	6
Right side	2	6

Check. Count every atom again. The two sides match.

$N_2 + 3\,H_2 \longrightarrow 2\,NH_3$

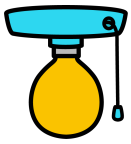
Atoms	N	H
Left side	2	6
Right side	2	6



PREVIEW

Preview - Bright Path Shed

My name _____ Date _____



Worked Example 2

Read how it is done. Follow along.

Example. Balance $C_3H_8 + O_2 \longrightarrow CO_2 + H_2O$ The equation is a standard one; the steps are the same for any equation.

Start. Count the atoms in the skeleton equation.

$$C_3H_8 + O_2 \longrightarrow CO_2 + H_2O$$

Atoms	C	H	O
Left side	3	8	2
Right side	1	2	3

Step 1. Balance C. The left side has 3 C and the right side has 1 C. Put a 3 in front of CO_2.

$$C_3H_8 + O_2 \longrightarrow 3\,CO_2 + H_2O$$

Atoms	C	H	O
Left side	3	8	2
Right side	3	2	7

Step 2. Balance H. The left side has 8 H and the right side has 2 H. Put a 4 in front of H_2O.

$$C_3H_8 + O_2 \longrightarrow 3\,CO_2 + 4\,H_2O$$

Atoms	C	H	O
Left side	3	8	2
Right side	3	8	10

Step 3. Balance O. The left side has 2 O and the right side has 10 O. Put a 5 in front of O_2.

$$C_3H_8 + 5\,O_2 \longrightarrow 3\,CO_2 + 4\,H_2O$$

Atoms	C	H	O
Left side	3	8	10
Right side	3	8	10

Check. Count every atom again. The two sides match.

$$C_3H_8 + 5\,O_2 \longrightarrow 3\,CO_2 + 4\,H_2O$$

Atoms	C	H	O
Left side	3	8	10
Right side	3	8	10

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Balance It 1A

Write a number in each box. Count the atoms.

Metals joining oxygen or chlorine. Count the atoms in the table.

1 ☐ Mg + ☐ O_2 → ☐ MgO

Atoms	Mg	O
Left side		
Right side		

Do the rows match? ☐ **balanced** ☐ **not yet**

2 ☐ Na + ☐ Cl_2 → ☐ NaCl

Atoms	Na	Cl
Left side		
Right side		

Do the rows match? ☐ **balanced** ☐ **not yet**

3 ☐ Fe + ☐ O_2 → ☐ Fe_2O_3

Atoms	Fe	O
Left side		
Right side		

Do the rows match? ☐ **balanced** ☐ **not yet**

4 ☐ Al + ☐ O_2 → ☐ Al_2O_3

Atoms	Al	O
Left side		
Right side		

Do the rows match? ☐ **balanced** ☐ **not yet**

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Balance It 2A

Write a number in each box. Count the atoms.

Burning carbon compounds. Count the atoms in the table.

1 ☐ C_2H_6 + ☐ O_2 → ☐ CO_2 + ☐ H_2O

Atoms	C	H	O
Left side			
Right side			

Do the rows match? ☐ **balanced** ☐ **not yet**

2 ☐ C_4H_{10} + ☐ O_2 → ☐ CO_2 + ☐ H_2O

Atoms	C	H	O
Left side			
Right side			

Do the rows match? ☐ **balanced** ☐ **not yet**

3 ☐ C_2H_5OH + ☐ O_2 → ☐ CO_2 + ☐ H_2O

Atoms	C	H	O
Left side			
Right side			

Do the rows match? ☐ **balanced** ☐ **not yet**

4 ☐ C_2H_2 + ☐ O_2 → ☐ CO_2 + ☐ H_2O

Atoms	C	H	O
Left side			
Right side			

Do the rows match? ☐ **balanced** ☐ **not yet**

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Balance It 3A

Write a number in each box. Count the atoms.

Parentheses: treat the group as one. Count the atoms in the table.

1 ☐ $Ca(OH)_2$ + ☐ HCl → ☐ $CaCl_2$ + ☐ H_2O

Atoms	Ca	O	H	Cl
Left side				
Right side				

Do the rows match? ☐ **balanced** ☐ **not yet**

2 ☐ $Al(OH)_3$ + ☐ H_2SO_4 → ☐ $Al_2(SO_4)_3$ + ☐ H_2O

Atoms	Al	O	H	S
Left side				
Right side				

Do the rows match? ☐ **balanced** ☐ **not yet**

3 ☐ Na_3PO_4 + ☐ $CaCl_2$ → ☐ $Ca_3(PO_4)_2$ + ☐ $NaCl$

Atoms	Na	P	O	Ca	Cl
Left side					
Right side					

Do the rows match? ☐ **balanced** ☐ **not yet**

4 ☐ Fe_2O_3 + ☐ CO → ☐ Fe + ☐ CO_2

Atoms	Fe	O	C
Left side			
Right side			

Do the rows match? ☐ **balanced** ☐ **not yet**

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Read the Model

Look at the picture. Write the numbers.

H hydrogen | Cl chlorine | C carbon | O oxygen

Each picture shows how many molecules are in the balanced equation. Write the number of each in the boxes.

1



☐ H_2 + ☐ Cl_2 → ☐ HCl

Count the circles. Do both sides match? ☐ yes ☐ no

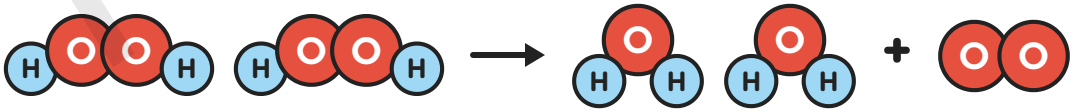
2



☐ CO + ☐ O_2 → ☐ CO_2

Count the circles. Do both sides match? ☐ yes ☐ no

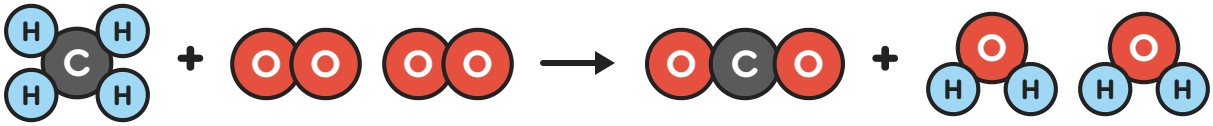
3



☐ H_2O_2 → ☐ H_2O + ☐ O_2

Count the circles. Do both sides match? ☐ yes ☐ no

4



☐ CH_4 + ☐ O_2 → ☐ CO_2 + ☐ H_2O

Count the circles. Do both sides match? ☐ yes ☐ no

PREVIEW

My name _____ Date _____

Find the Mistake 2

Find the mistake. Then fix it.

Riley is made up for practice. Each problem has one mistake.

1 **Riley wrote:** $Mg(OH)_2 + 2\,HCl \rightarrow MgCl_2 + H_2O$

Riley says: "$Mg(OH)_2$ has one H, so 2 HCl is enough."

Atoms	Mg	O	H	Cl
Left side				
Right side				

☐ **balanced** ☐ **not balanced** ☐ **not the smallest numbers**

Fix it: ☐ $Mg(OH)_2$ + ☐ $HCl \rightarrow$ ☐ $MgCl_2$ + ☐ H_2O

2 **Riley wrote:** $2\,CH_3OH + 2\,O_2 \rightarrow 2\,CO_2 + 4\,H_2O$

Riley says: "C and H match, so the oxygen must match too."

Atoms	C	H	O
Left side			
Right side			

☐ **balanced** ☐ **not balanced** ☐ **not the smallest numbers**

Fix it: ☐ CH_3OH + ☐ $O_2 \rightarrow$ ☐ CO_2 + ☐ H_2O

3 **Riley wrote:** $2\,Al + 3\,H_2SO_4 \rightarrow Al_2(SO_4)_3 + H_2$

Riley says: "I fixed Al and SO_4, so I am finished."

Atoms	Al	H	S	O
Left side				
Right side				

☐ **balanced** ☐ **not balanced** ☐ **not the smallest numbers**

Fix it: ☐ Al + ☐ $H_2SO_4 \rightarrow$ ☐ $Al_2(SO_4)_3$ + ☐ H_2

PREVIEW

My name _____ Date _____

Mixed Review

Balance each equation. Count the atoms.

A mix of everything. Write a coefficient in each box. Then count the atoms in the table.

1 ☐ Mg + ☐ $AgNO_3$ → ☐ $Mg(NO_3)_2$ + ☐ Ag

Atoms	Mg	Ag	N	O
Left side				
Right side				

Do the rows match? ☐ **balanced** ☐ **not yet**

2 ☐ Li + ☐ N_2 → ☐ Li_3N

Atoms	Li	N
Left side		
Right side		

Do the rows match? ☐ **balanced** ☐ **not yet**

3 ☐ $Mg(OH)_2$ + ☐ H_3PO_4 → ☐ $Mg_3(PO_4)_2$ + ☐ H_2O

Atoms	Mg	O	H	P
Left side				
Right side				

Do the rows match? ☐ **balanced** ☐ **not yet**

4 ☐ $Ba(NO_3)_2$ + ☐ Na_2SO_4 → ☐ $BaSO_4$ + ☐ $NaNO_3$

Atoms	Ba	N	O	Na	S
Left side					
Right side					

Do the rows match? ☐ **balanced** ☐ **not yet**

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Cut and Paste 1

Cut out the six pieces. Paste each one in the right box.

Count the atoms on each side of each piece. Do the two sides match?

Balanced	Not balanced

PREVIEW

Cut on the dashed lines: six pieces, two straight cuts across and two down.

$Fe + 2\,O_2 \rightarrow Fe_3O_4$	$2\,Ca + O_2 \rightarrow 2\,CaO$	$Mg + 2\,HCl \rightarrow MgCl_2 + H_2$
$H_2 + N_2 \rightarrow 2\,NH_3$	$2\,HgO \rightarrow Hg + O_2$	$2\,Al + 3\,Br_2 \rightarrow 2\,AlBr_3$

Pick one Not balanced piece. What would you change?

Preview - Bright Path Sped

My name _____ Date _____

Cut and Paste 3

Cut out the six pieces. Paste each one in the right box.

Each box shows a balanced equation. Paste the atom count that belongs to it.

$H_2 + F_2 \longrightarrow 2\ HF$	$CaCO_3 \longrightarrow CaO + CO_2$	$2\ Fe + 3\ Cl_2 \longrightarrow 2\ FeCl_3$

$Cu + 2\ AgNO_3 \longrightarrow Cu(NO_3)_2 + 2\ Ag$	$3\ Mg + N_2 \longrightarrow Mg_3N_2$	$Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$

Cut on the dashed lines: six pieces, two straight cuts across and two down.

Cu 1, Ag 2, N 2, O 6	**H 2, F 2**	**Zn 1, Cu 1, S 1, O 4**
Mg 3, N 2	**Ca 1, C 1, O 3**	**Fe 2, Cl 6**

How did you find the match?

PREVIEW

Answer Key: Review, Words, Models, Counts

In Draw the Model, accept any drawing that shows that many molecules and the right atoms. Each equation was checked by a program that counts every atom, including atoms inside parentheses, and finds the smallest whole-number coefficients.

Mixed Review page 24

#	Balanced equation	Atoms on each side
1	$Mg + 2\ AgNO_3 \longrightarrow Mg(NO_3)_2 + 2\ Ag$	Mg 1, Ag 2, N 2, O 6
2	$6\ Li + N_2 \longrightarrow 2\ Li_3N$	Li 6, N 2
3	$3\ Mg(OH)_2 + 2\ H_3PO_4 \longrightarrow Mg_3(PO_4)_2 + 6\ H_2O$	Mg 3, O 14, H 12, P 2
4	$Ba(NO_3)_2 + Na_2SO_4 \longrightarrow BaSO_4 + 2\ NaNO_3$	Ba 1, N 2, O 10, Na 2, S 1

Words to Equations page 23

#	Balanced equation	Atoms on each side
1	$2\ Al + 3\ Cl_2 \longrightarrow 2\ AlCl_3$	Al 2, Cl 6
2	$2\ NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2\ H_2O$	Na 2, O 6, H 4, S 1
3	$Zn + 2\ HCl \longrightarrow ZnCl_2 + H_2$	Zn 1, H 2, Cl 2

Read and Draw the Model pages 19, 20

#	Balanced equation	Coefficients
A1	$H_2 + Cl_2 \longrightarrow 2\ HCl$	1, 1, 2
A2	$2\ CO + O_2 \longrightarrow 2\ CO_2$	2, 1, 2
A3	$2\ H_2O_2 \longrightarrow 2\ H_2O + O_2$	2, 2, 1
A4	$CH_4 + 2\ O_2 \longrightarrow CO_2 + 2\ H_2O$	1, 2, 1, 2
B1	$N_2 + O_2 \longrightarrow 2\ NO$	1, 1, 2
B2	$2\ NO + O_2 \longrightarrow 2\ NO_2$	2, 1, 2
B3	$2\ NH_3 \longrightarrow N_2 + 3\ H_2$	2, 1, 3

Words page 6

#	Word	Letter
1	Reactant	B
2	Product	E
3	Coefficient	F
4	Subscript	A
5	Conservation of mass	D
6	Balanced equation	C

Atom counts pages 6, 7

#	Formula	Atoms
7	$3H_2O$	H 6, O 3
8	$2Ca(OH)_2$	Ca 2, O 4, H 4
9	$2Al_2(SO_4)_3$	Al 4, S 6, O 24
C1	$2MgO$	Mg 2, O 2
C2	$3CO_2$	C 3, O 6
C3	$4NH_3$	N 4, H 12
C4	$3Mg(NO_3)_2$	Mg 3, N 6, O 18
C5	$2Fe_2O_3$	Fe 4, O 6
C6	$2Al(OH)_3$	Al 2, O 6, H 6

Your Turn pages 10, 12

Page	Balanced equation	Atoms each side
Your Turn 1	$2\ H_2 + O_2 \longrightarrow 2\ H_2O$	H 4, O 2
Your Turn 2	$C_2H_4 + 3\ O_2 \longrightarrow 2\ CO_2 + 2\ H_2O$	C 2, H 4, O 6

PREVIEW

Balancing Tracker

One student, every scored page. Filled example: page 36.

Student _____ Teacher _____ Month _____

Page	Page type and set	Items	Right	Date	Notes
6	Words and Atom Counts	9			
7	Count the Atoms	6			
13	Balance It 1A	4			
14	Balance It 1B	4			
15	Balance It 2A	4			
16	Balance It 2B	4			
17	Balance It 3A	4			
18	Balance It 3B	4			
19	Read the Model	4			
20	Draw the Model	3			
21	Find the Mistake 1	3			
22	Find the Mistake 2	3			
23	Words to Equations	3			
24	Mixed Review	4			
26	Cut and Paste 1	6			
27	Cut and Paste 2	6			
28	Cut and Paste 3	6			

PREVIEW

How to fill this in

Write how many items the student got right with no prompt, and the date. A blank means not tried yet, never wrong. There are 77 items on the 17 scored pages. Answer keys: pages 29 to 31. Filled example: page 36.

This month we are working on (your own standard or wording)

Team Note

Use this page between team meetings or when a student moves classes, to hand off what changed without writing a note from scratch. Everything below is observable, with a blank for the number or the wording your team already uses.

Student _____ Team member _____ Date _____

Page type	Covered since last note (Y/N)	Items right	Still blank
Balance It sets 1 to 3			
Models			
Find the mistake			
Words to equations			
Mixed review			
Sorts			

What I saw (observable, not a conclusion)

- Balanced ___ of ___ equations without a prompt.
- Counted atoms inside parentheses correctly on ___ of ___ (Set 3, pages 17 and 18).
- Changed only coefficients, never a subscript: yes / no / with a reminder.
- Checked every atom at the end: yes / no / with a reminder.

Next step

- Next page or set: ___, because ___ (what you saw).
- What to try in another class or at home: ___.
- What to keep doing because it is working: ___.
- Anything for the team meeting to decide: ___ (this page records what happened, never a label or a plan).

Summary, in one or two sentences, for whoever reads this next

A filled-in line, for reference

"Balanced 3 of 4 equations on Balance It 1B without a prompt on 10/9. Next step: write the atom count after each change before moving on." That is the level of detail this page is built for. It matches the filled example on page 36.

PREVIEW

Priya's Tracker (Invented Student)

Priya S. is invented; nothing on this page describes a real student. The blank tracker is on page 32.

Student	Teacher	Month
Priya S. (an invented student)	Mr. Okafor (invented)	October

Page	Page type and set	Items	Right	Date	Notes
6	Words and Atom Counts	9	7	10/6	Mixed up subscript and coefficient on two
7	Count the Atoms	6	6	10/7	-
13	Balance It 1A	4	4	10/8	-
14	Balance It 1B	4	3	10/9	Forgot the 2 in O2 once
15	Balance It 2A	4	2	10/13	Counted O last, ran out of room
16	Balance It 2B	4	-	-	-
17	Balance It 3A	4	-	-	-
18	Balance It 3B	4	-	-	-
19	Read the Model	4	3	10/15	Miscounted one molecule
20	Draw the Model	3	-	-	-
21	Find the Mistake 1	3	2	10/16	Found the mistake, fix not finished
22	Find the Mistake 2	3	-	-	-
23	Words to Equations	3	-	-	-
24	Mixed Review	4	-	-	-
26	Cut and Paste 1	6	5	10/17	One piece pasted in the wrong box
27	Cut and Paste 2	6	-	-	-
28	Cut and Paste 3	6	-	-	-

How to read it

Priya S. has done **8 of 17** scored pages and got **32 of 40** items right with no prompt. **2** pages were all right and **6** carry a note. Every number comes from the table.

What the table points to

The lowest page is Balance It 2A (2 of 4). That is where the next practice goes. The 9 pages left blank are not tried yet, never wrong.

PREVIEW

Binder Cover

Slide this into the front of a binder. The divider tabs and a spine label to cut out are on the next page (page 39).

Science - Chemistry



BALANCING CHEMICAL EQUATIONS

Conservation of Mass

Learn | **Practice** | **Check**

Teacher _____

Class or student _____

PREVIEW