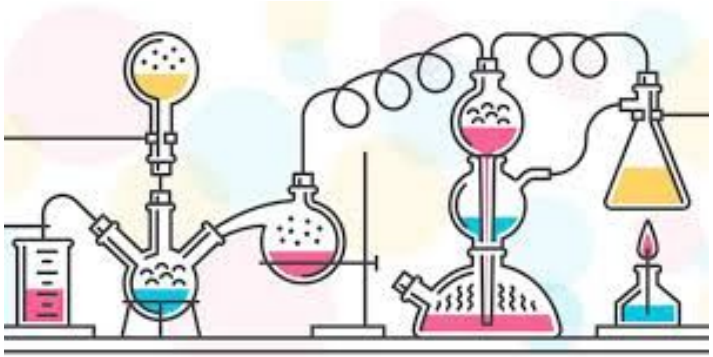
Balancing Chemical Equations

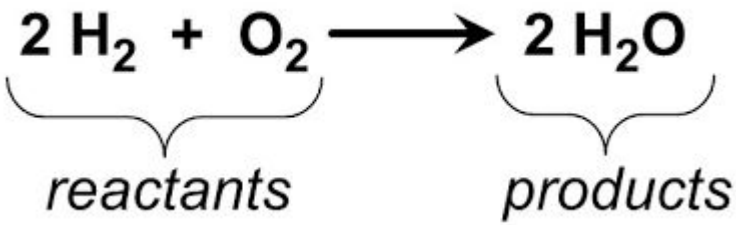
Chemistry

What is a Chemical Reaction?

A **process** in which elements and compounds **combine** to form new substances.



Reactants & Products



Chemical reactions are shown by a chemical equation containing reactants and products.

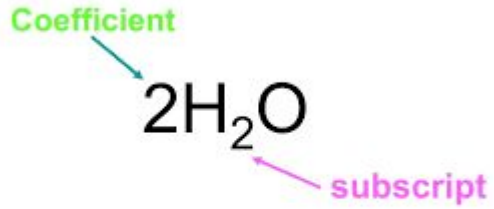
Reactants & Products

Reactant: a substance that is present at the beginning of a chemical reaction.

Reactants & Products

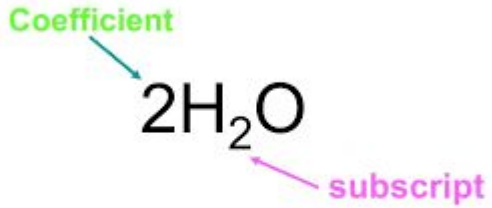
Product: a substance that is produced during a chemical reaction

Coefficients & Subscripts



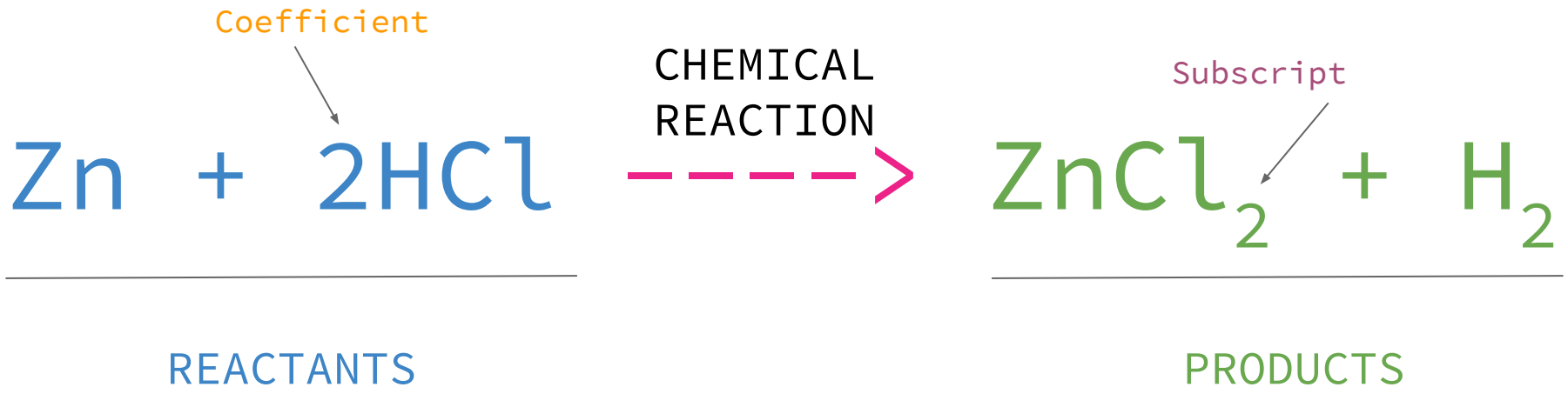
Coefficients and subscripts are present in chemical formulas to tell how many atoms or molecules are present.

The arrow



The arrow in between the reactants and products means that a **chemical reaction is taking place**.

Parts of a Chemical Equation



When writing chemical equations, the **Law of Conservation of Mass** has to be a priority.

Definition of Law of Conservation of Mass:

matter is never created or destroyed

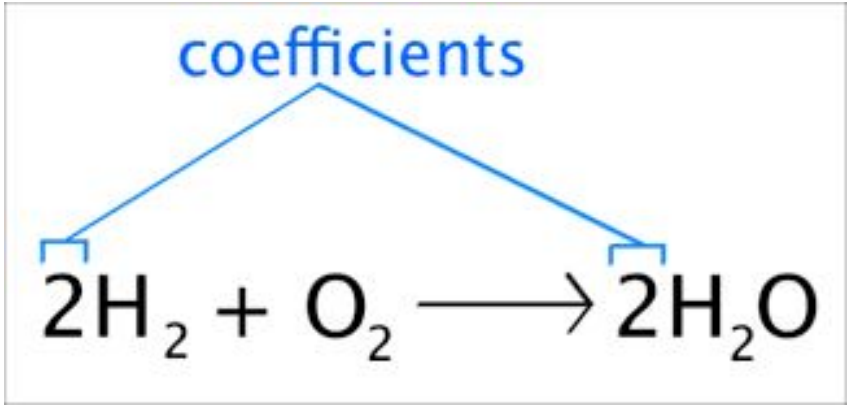
Why is this important?

The **total mass** of the reactants HAS TO BE the *same* as the **total mass** of the products. That's why we must count atoms!

Rules

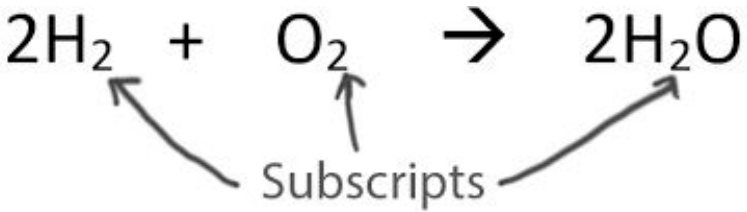
Rules of Balancing Chemical Equations:

1. You can only add a coefficient **in front** of a chemical formula.



Rules of Balancing Chemical Equations:

2. You cannot change any subscripts and you cannot add any subscripts.



Rules of Balancing Chemical Equations:

4. You MUST end up with the same number and kind of atoms on both sides of the equations when you are finished.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

C=1		C=1
H=4	=	H=4
O=4		O=4

Examples

EXAMPLE + STEPS: ORIGINAL EQUATION

EXAMPLE + STEPS: COUNT THE ATOMS ON BOTH SIDES

REACTANTS:

Na - 4

O - 2

PRODUCTS:

Na - 4

O - 2

IS THIS EQUATION BALANCED?

YES.

You have equal atoms of Na and O on both sides.

EXAMPLE + STEPS: ORIGINAL EQUATION

EXAMPLE + STEPS: COUNT THE ATOMS ON BOTH SIDES

REACTANTS:

C - 1
O - 1
H - 2

PRODUCTS:

C - 1
O - 1
H - 4

IS THIS EQUATION BALANCED?

NO.

You have 2 atoms of H on the left, and 4 atoms of H on the right.

EXAMPLE + STEPS: LOOK FOR THE UNEQUAL ATOMS

REACTANTS:

C - 1

O - 1

H - 2

PRODUCTS:

C - 1

O - 1

H - 4

Example + steps: Solve & Recount Atoms.

REACTANTS:

C - 1

O - 1

H - 4

If I have 2 C on the left, and 4 C on the right, I can add a coefficient to the left.

PRODUCTS:

C - 1

O - 1

H - 4

IS THIS EQUATION BALANCED?

YES.

You now have equal atoms of all elements on both sides.

EXAMPLE + STEPS: ORIGINAL EQUATION

EXAMPLE + STEPS: COUNT THE ATOMS ON BOTH SIDES

REACTANTS:

H - 2

O - 2

PRODUCTS:

H - 2

O - 1

IS THIS EQUATION BALANCED?

NO.

You have 2 atoms of O on the left, and 1 atom of O on the right.

EXAMPLE + STEPS: LOOK FOR THE UNEQUAL ATOMS

REACTANTS:

H – 2

O – 2

PRODUCTS:

H – 2

O – 1

Example + steps: Solve & Recount Atoms.

Since I KNOW I need 2 atoms of O on the left, I have to put a 2 in front of H_2O.

REACTANTS:

H – 2

O – 2

By getting the 2 O atoms that I needed, I messed up my H atoms.

PRODUCTS:

H – 4

O – 2

Example + steps: Solve & Recount Atoms.

REACTANTS:

H – 4

O – 2

Since I know I need 4 H on both sides, I have to but a coefficient of 4 on the H_2 now.

PRODUCTS:

H – 4

O – 2

IS THIS EQUATION BALANCED?

YES.

You now have equal atoms of all elements on both sides.