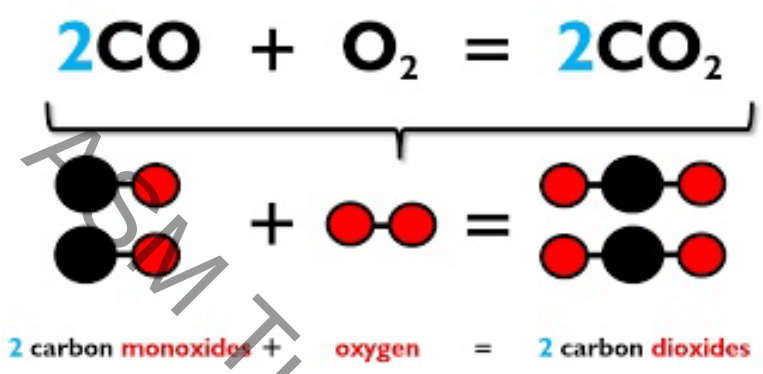
Formulas and Equations

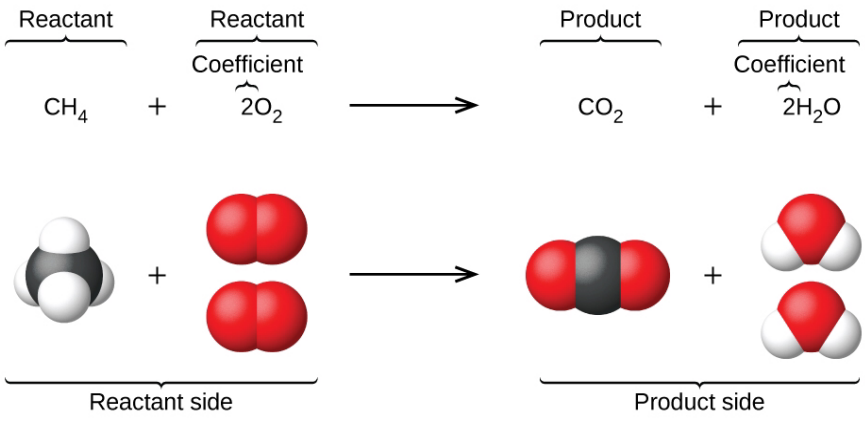
Symbols and Formulas

- Just Element can be represented by Symbols while compounds are represented by Formulas
- Formulas are made up of Element symbols in the same proportions that element found in Compounds



Writing Chemical Equation:

1. The substances undergoing reaction are called reactants, and their formulas are placed on the left side of the equation.
2. The substances generated by the reaction are called products, and their formulas are placed on the right sight of the equation.
3. Plus signs (+) separate individual reactant and product formulas, and an arrow (⟶)separates the reactant and product (left and right) sides of the equation.
4. The relative numbers of reactant and product species are represented by coefficients(numbers placed immediately to the left of each formula). A coefficient of 1 is typically omitted.



What is a balanced equation?

Chemical equation with an equal number of atoms present in reactants side and products side is called a balanced equation. Balanced equation is also called a **stoichiometric equation.**

Example:

Take the example of the forming of the water molecule from the hydrogen and oxygen atoms. The equation is as follows:

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

How to balance equations?

For balancing a chemical equation, we follow seven basic steps.

Step 1:

To balance a chemical equation, first draw boxes around each reactant and product and do not make any changes to it.

$$Fe + H_2O \rightarrow Fe_3O_4 + H_2$$

Step 2: List the number of atoms of each element present in the unbalanced equation.

	Reactants (left side)	Products (Right side)
Element	Number of atoms	Number of atoms
Fe	1	3
H	2	2
O	1	4

Step 3:

- We should always choose a compound with a maximum number of atoms in it, either on reactants side or products side.

$$Fe + H_2O \rightarrow Fe_3O_4 + H_2$$

- Here we select Fe_3O_4 which contains 4 oxygen atoms on the right hand side.

As we cannot make H_2O to H_2O_4 in order to increase oxygen atoms, so we make it to $4H_2O$.

$$Fe + 4H_2O \rightarrow Fe_3O_4 + H_2$$

Step 4:

- Balance other atoms now like Fe and H.

$$Fe + 4H_2O \rightarrow Fe_3O_4 + H_2$$

- Atoms of H are 8 on L.H.S and 2 ON R.H.S, so multiply H_2 on R.H.S with 4, so we get

$$Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$$

Step 5:

$$Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$$

- Pick the last element Fe from the above partly balanced equation. Fe are 3 on R.H.S and 1 on L.H.S, so multiply 3 on L.H.S

$$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$$

Step 6:

- Check the equation whether it is balanced or not by counting the number of atoms on L.H.S and R.H.S

$$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$$

This is the balanced equation.

Step 7:

Indicate the physical state of all the reactants and products by writing symbols in brackets as subscripts on the right corner below the formula.

Balanced Chemical Equation:

$$3Fe(s) + 4H_2O(l) \rightarrow Fe_3O_4(s) + 4H_2(g)$$

State symbol	Meaning
(s)	Solid
(l)	Liquid
(g)	Gas
(aq)	Aqueous solution