Chp 20.2

Balancing Equations

Conservation of atoms

- The conservation of atoms says that the number of each type of atom on the reactants side of a chemical equation must equal the number of each type of atom on the product side.

$$CH_4 + O_2 \longrightarrow CO_2 + H_2O$$

Reactants Products

type of atom	total on reactants side	total on products side	balanced?
C	1	1	yes
H	4	2	no
O	2	3	no

Coefficient

- In order to change the number of molecules of a compound, you add a coefficient in front of the chemical formula.

coefficient ← $2CH_4$ → subscript

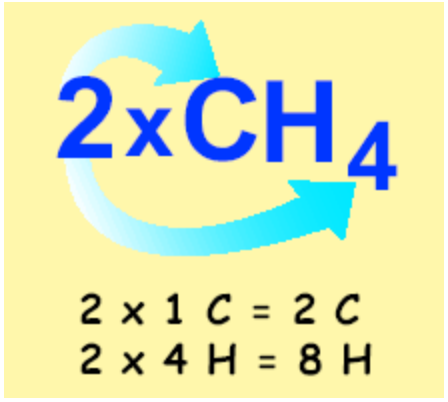
coefficient

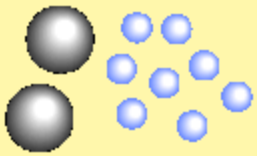
tells you how many of each type of reactant or product in the reaction

subscript

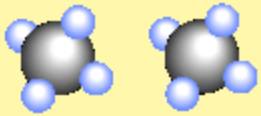
tells you the number of each type of atom in the substance

A coefficient of 2 in front of methane: $2CH_4$ gives you...





2 carbon atoms and 8 hydrogen atoms



enough carbon and hydrogen atoms to make 2 molecules of methane

IMPORTANT: Remember

1. Make sure you have written the correct chemical formula for each reactant.
2. **The subscripts in the chemical formulas of the reactants and products CANNOT be changed during the process of balancing.**
3. The coefficients are placed in front of the formulas to make the number of atoms on each side equal.

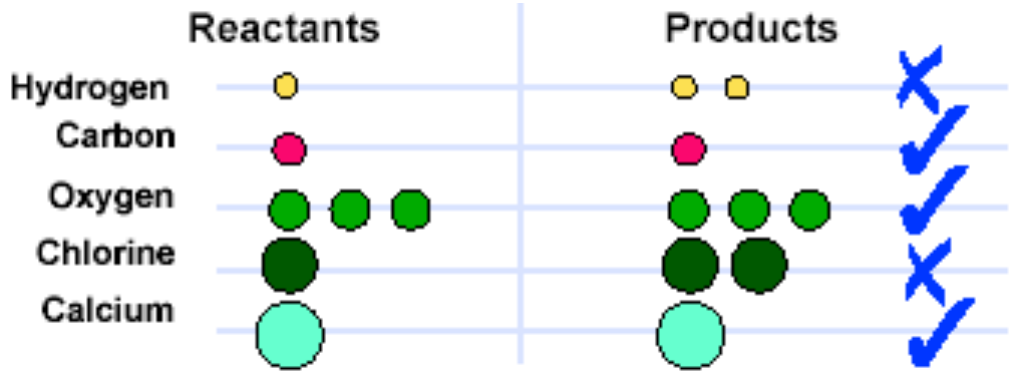
Balancing Equations

1. Count the number of each type of atom on both sides of the reaction.
2. Add coefficients to balance everything EXCEPT Hydrogen and Oxygen.
3. Balance Hydrogen and Oxygen.

Video on Balancing Equations

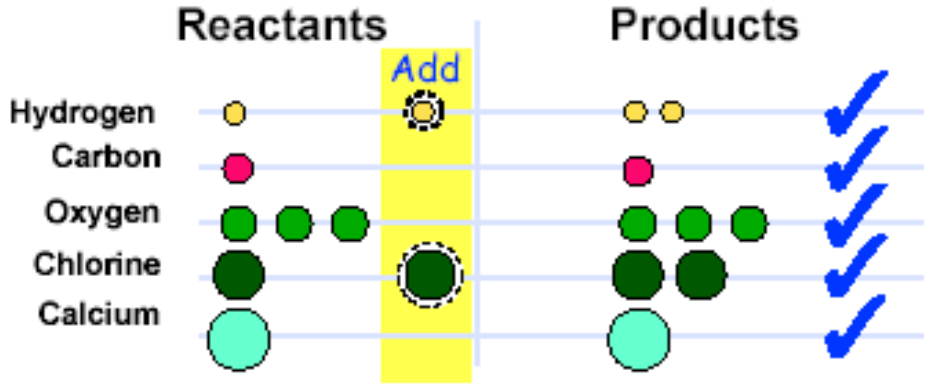
Step 1

$$HCl + CaCO_3 \rightarrow CaCl_2 + CO_2 + H_2O$$



Step 2

$$2HCl + CaCO_3 \rightarrow CaCl_2 + CO_2 + H_2O$$



atom	reactants	products
H	1 X 2 = **2**	2
Cl	1 X 2 = **2**	2
Ca	1	1
C	1	1
O	3	3

$$CH_4 + O_2 \longrightarrow CO_2 + H_2O$$

type of atom	total on reactants side	total on products side	balanced?
C	1	1	yes
H	4	2	no
O	2	3	no

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

atom	total on reactants side	total on products side
C	1	1
H	4	2 X 2 = **4**
O	2 X 2 = **4**	2 + (2 X 1) = **4**