Balancing Chemical Reactions

Chemical reactions are like recipes in that the quantity and types of ingredients, or **reactants**, can be related to the quantity and type of cooked food, or **product(s)**

Atom Accounting

How many nitrogen atoms are in 1 N_2O_5 molecule?

In one molecule, there are two nitrogen atoms, as notated by the subscript $_2$.

How many nitrogen atoms are in 2 N2O5 molecules?

2 molecules Å 2 nitrogen = 4 nitrogen atoms

How many phosphate groups and oxygen atoms are in 1 formula unit of $Cu_3(PO_4)_2$?

1 formula unit Å 2 phosphate groups Å 4 oxygen atoms = 8 oxygen atoms

How many oxygen atoms are in 3 formula units of $Cu_3(PO_4)_2$?

3 formula units Å 2 phosphate groups Å 4 oxygen atoms = 24 oxygen atoms

How many oxygen atoms are in 1 molecule of CO_2 and 1 molecule of H2O?

(1 molecule CO_2 Å 2 oxygen atoms) + (1 molecule H_2O Å 1 oxygen atom) = 3 oxygen atoms

How many oxygen atoms are in 4 molecules of CO_2 and 7 molecules of H_2O?

(4 molecules CO_2 Å 2 oxygen atoms) + (7 molecule H_2O Å 1 oxygen atom) = 15 oxygen atoms

How many oxygen atoms are in 7 formula units of $Cu_3(PO_4)_2$ and 4 formula units of Na_2SO_4?

(7 formula units Å 2 phosphate groups Å 4 oxygen atoms) + (4 formula units Å 4 oxygen atoms) = 72 oxygen atoms

Example: Hydrogen gas and oxygen gas yields water

$$\_\_\_H_2 \quad + \quad \_\_\_O_2 \quad \rightarrow \quad \_\_\_H_2O$$

Reactants	Products
H = 2	H = 2
O = 2	O = 1

The oxygen atoms are unbalanced on the right side, so the coefficient of water has to be increased. Let's try 2 molecules. Do not forget to recalculate the count of each atom type in the molecule(s) you're increasing.

$$\_\_\_H_2 \quad + \quad \_\_\_O_2 \quad \rightarrow \quad \_2\_H_2O$$

Reactants	Products
H = 2	H = 4

Practice Problems