

HOW TO COUNT ATOMS

Background Information:

- **subscripts** – little numbers that tell how many atoms there are (ex: In $3\text{H}_2\text{O}$, the 2 is the subscript)
- **coefficients** – regular-sized numbers that tell how many molecules there are (ex: In $3\text{H}_2\text{O}$, the 3 is the coefficient)

Example: $3\text{H}_2\text{O}$

- The **subscript** 2 in the example above comes after the H. This means there are two H's (hydrogen atoms) in each molecule.
- The **coefficient** 3 shows that there are three of the H_2O molecules.

When counting atoms in the example ($3\text{H}_2\text{O}$), we can look at the atoms this way [since there are 3 of the H_2O molecules]: (3 water molecules each with 2 hydrogen and 1 oxygen)



- So now, we can count the number of H's and the number of O's. Thus, $3\text{H}_2\text{O}$ has **6 hydrogen atoms** and **3 oxygen atoms**.

However, drawing out each equation is **not practical**, so...

Although the 1 is usually not written, $3\text{H}_2\text{O}$ can be written as $3\text{H}_2\text{O}_1$.

(In other words, $3\text{H}_2\text{O}$ and $3\text{H}_2\text{O}_1$ are the same thing.) The number of atoms can be counted without drawing everything out **by multiplying the coefficient by all the subscripts in the molecule (you get the number of atoms)**. So with the case of $3\text{H}_2\text{O}_1$, we can multiply the 3 with the 2 to find that there are 6 H's. Then we can multiply the 3 with the 1 to find that there are 3 O's.

HOW TO COUNT ATOMS IN A CHEMICAL FORMULA

(5 Easy Steps)

Step 1: Write the chemical formula

Step 2: List all the atoms

Step 3: Count the number of atoms of each element in ONE molecule.

Step 4: Multiply the number of atoms of each by the coefficient.

Step 5: Make sure your answer makes sense.

PRACTICE TIME: Count the number of each type of atom in each molecule.

$P_4 + O_2$	$4P_2O_3$
P 4	P $2 * 4 = 8$
O 2	O $3 * 4 = 12$

Two More Practice Example

6 C_2H_5OH (Ethanol)

C - $2 * 6 = 12$

H - $6 * 6 = 36$

O - $1 * 6 = 6$

4 $C_6H_{12}O_6$ (Glucose - Sugar)

C - $6 * 4 = 24$

H - $12 * 4 = 48$

O - $6 * 4 = 24$