

Crack the code!

How do you count atoms in the law of conservation of mass?

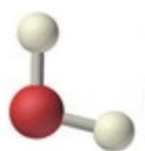
In a chemical reaction the total mass of all the substances taking part in the reaction remains the same. Also, the number of atoms in a reaction remains the same. Mass cannot be created or destroyed in a chemical reaction.



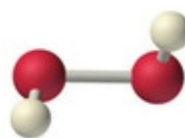
BaNa₂

To count the atoms of an element in a **chemical formula**, you can use the subscripts in the formula. The **subscript** indicates the number of atoms of that element in the compound. For example, in the compound H₂O, there are 2 atoms of hydrogen and 1 atom of oxygen.

The subscripts are part of the formulas and once the formulas are determined, the subscripts may not be changed.



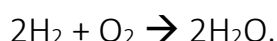
Water H₂O



Hydrogen peroxide H₂O₂

The numbers placed *in front* of formulas to balance equations are called **coefficients**, and they multiply all the atoms in a formula. E.g. 2H₂ means H₂ and H₂, so there are 4 atoms of hydrogen.

This **chemical equation** shows conservation of atoms.



This equation demonstrates the law of conservation of matter, meaning that the numbers of atoms for each element are equal on both sides of the equation.

In this reaction, we have four hydrogen atoms and two oxygen atoms on each side, which complies with the conservation of atoms principle.

Parentheses (or you can call them **brackets** at Level 1)

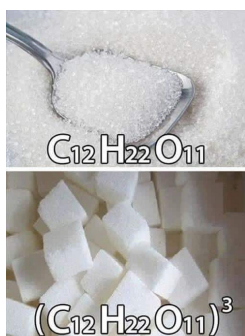
When the formula contains two *or more* of the same polyatomic ion, that ion is written in parentheses with the subscript written outside the parentheses. E.g. copper hydroxide, Cu(OH)₂. This is the way the formula is written, rather than CuOH₂.

This means there are two hydroxide ions, so overall there are 1 x Cu, 2 x O and 2 x H 'atoms'.

Consider Copper nitrate: Copper nitrate Cu(NO₃)₂ contains 1 x Cu, 2 x N, 6 x O atoms.

Test your understanding

	Na	H	C	O
NaOH				
Na ₂ CO ₃				
2NaHCO ₃				
CH ₃ COONa				
Na ₃ C ₆ H ₅ O ₇				
C ₆ H ₅ COONa				
3Na ₂ O				
Na ₂ O ₂				
3CO ₂				
C ₆ H ₁₂ O ₆				



	Cu	S	H	N	O	C
CuSO ₄						
Cu(OH) ₂						
CuS						
3CuO						
CuCO ₃						
2Cu(NO ₃) ₂						
Cu ₃ N						
CuSO ₄ ·5H ₂ O						