Relative masses of atoms and molecules

The masses of atoms and molecules are really small. For e.g. a hydrogen atom has a mass of 1.0×10^{-24} g. These numbers are very small and difficult to do calculations, so we use relative masses.

Relative isotopic mass

Isotopes are elements of the same element with a different number of neutrons, so they have different masses. This is why they are compared to the carbon-12 atom which has a relative isotopic mass of 12.0.

> **Relative isotopic mass is the mass of an isotope relative to the mass of one atom of carbon-12 with a mass of 12.0.**

Relative atomic mass, A_r

Most elements have isotopes, but they do not have the same mass.

> **Relative atomic mass is the mass of the average mass of isotopes relative to one atom of the carbon-12 atom with a mass of 12.0.**

The relative atomic mass is a weighted value or average of the isotopes. For e.g. chlorine has 2 isotopes, ^{35}Cl and ^{37}Cl. The relative atomic mass is 35.5.

Boron also has 2 isotopes, ^{10}B and ^{11}B. The relative atomic mass is 10.8.

Note that there is no chlorine atom with the mass of 35.5, or boron with a mass of 10.8. This value is simply a relative average for all chlorine/boron atoms.

Relative molecular mass, M_r

> **The relative molecular mass is the sum of all the relative atomic masses in a molecule.**

Ammonia or NH_3 has 4 atoms, and the relative molecular mass is

$N = 14.0,\ H = 1.0$

$NH_3 = 14.0 + 3(1.0)$

$NH_3 = 17.0$

It is safer to count one decimal.