

The relative formula mass is the term used to denote ionic compounds that do not exist as individual molecules.

$$(M_r) = \frac{\text{Average mass of one molecule}}{\text{one - twelfth of the mass of one carbon - 12 atom}}$$

Relative molecular mass (M_r) & relative formula mass

Mass spectrometer: Separates the atoms of a sample according to their masses. Used for finding the composition of each isotope in a sample. This data is used to calculate A_r .

Applications of mass spectroscopy

Time of Flight (TOF) Mass spectrometer: Sample is dissolved in polar, volatile solvent and is injected via a narrow capillary tube. Steps:

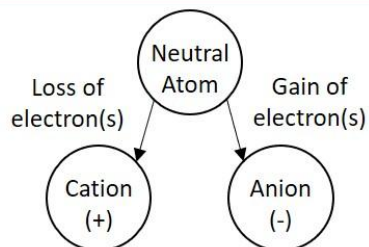
- Electron spray ionisation
- Acceleration ($K.E = \frac{1}{2}mv^2$)
- Ion drift ($t = d/v$): Lighter particles travel faster.
- Ion detection
- Data analysis (relative abundance vs. m/z)

Particle	Location	Relative mass	Relative charge
Proton	Nucleus	1	+1
Neutron	Nucleus	1	0
Electron	Shells	$\left(\frac{1}{1840}\right)$	-1

Structure of an atom

Atomic Structure-1

Ions



${}_P^MX$

X: symbol of the element

M: mass number or nucleon number

M=number of neutrons + number of protons

P: atomic number

P = number of protons

Mass number & Atomic number

Isotopes & Relative Atomic Mass (A_r)

Isotopes: Different forms of the same element having different masses. Same number of protons but a different number of neutrons.

$$(A_r) = \frac{\text{Average mass of one atom of an element}}{\text{one - twelfth of the mass of one carbon - 12 atom}}$$

$$A_r = \frac{\text{sum(isotopic mass} \times \text{relative abundance)}}{\text{total relative abundance}}$$

First ionisation energy of an element is the state to form gaseous $1+$ ions. energy required to remove one electron from each atom in one mole of atoms of the element in its gaseous state. The successive ionisation energies are always greater than the first ionisation energy.

Quantum shell	Maximum number of electrons
n=1	2
n=2	8
n=3	18
n=4	32

The electrons around the nucleus are arranged in principal quantum shells (symbol n).

The principal quantum shells (except for $n=1$) are split into sub-shells. The sub-shells are named as s (sharp), p (principal) and d (diffuse).

