# The "mol" and Avagadro's Number

**The Mol**

A unit used to count the number of particles of any form of matter.

One mol of any form of matter contains the same number of particles of another form of matter. (*atoms, ions, compounds, molecules, etc*)

**1 mol A = 1 mol B**
1mol particles A = 1mol particles B

**Avagadro's Number ($N_A$)**

The number of particles of matter contained in 1 mol

**1mol = $6.022 \times 10^{23}$particles**

Avagadro's Number was originally defined as the number of atoms in 12.00g of Carbon-12. 12.00g.

Avogadro's Number ($N_A$) is rounded from its original value.

$N_A = 6.02214076 \times 10^{23}$ part./mol

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# Microscale vs Macroscale Systems

Microchemistry (small)

Individual Particles
(atoms, ions, compounds, molecules)

Mass atom

In grams: ($1p^+$ or $1n^0 = 1.67 \times 10^{-24}$ g)

In atomic mass units: ($1p^+$ or $1n^0$ = 1 amu)

Macrochemistry (large)

Groups of Particles
(count, mass)

Groups of Atoms

In atom count: ($6.022 \times 10^{23}$ atoms)

In mol: (1 mol atoms)

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# The Mol and Avagadro's Number

Counting Atoms [Avagadro's # = $6.022 \times 10^{23}$ atoms/mol]

Definition of the mol: $1\,mol\ {}^{12}_{6}C$ = # atoms in $12.00g\ {}^{12}_{6}C$

Calculating Avagadro's Number $[N_A]$

${}^{12}_{6}C$ (12amu)

$12\,amu \cdot 1.67 \times 10^{-24}\,g/amu$

$= 2.004 \times 10^{-23}\,g\ {}^{12}_{6}C$

[Mass of 1 ${}^{12}_{6}C$]

$12.00g\ {}^{12}_{6}C$ (for $N_A$)

$$\frac{12.00\,g/mol}{2.004 \times 10^{-24}\,g/atom} = 5.99 \times 10^{23} \left(\frac{1/mol}{1/atom}\right)$$

$= 5.99 \times 10^{23}$ atoms/mol

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