Definition of the mole (IUPAC Recommendation 2017)

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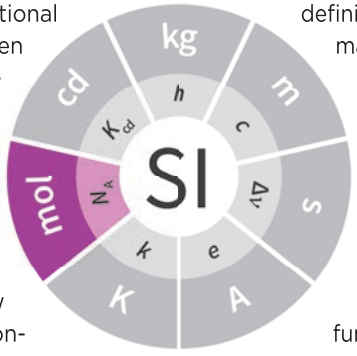
In 2011, the General Conference on Weights and Measures (CGPM) noted the intention of the International Committee for Weights and Measures (CIPM) to revise the entire International System of Units (SI) by linking all seven base units to seven fundamental physical constants. Of particular interest to chemists, new definitions for the kilogram and the mole have been proposed. A recent IUPAC Technical Report (*Pure Appl. Chem.* **89**, 951 (2017); https://doi.org/10.1515/pac-2016-0808) discussed these new definitions in relation to immediate consequences for the chemical community. This IUPAC Recommendation on the preferred definition of the mole follows from that Technical Report. It supports a definition of the mole based on a specified number of elementary entities, in contrast to the present 1971 definition.



The new definition is:

The mole, symbol mol, is the SI unit of amount of substance. One mole contains exactly 6.022 140 76 × 10^{23} elementary entities. This number is the fixed numerical value of the Avogadro constant, N_A, when expressed in mol^{-1}, and is called the Avogadro number. The amount of substance, symbol *n*, of a system is a measure of the number of specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, or any other particle or specified group of particles.

This new definition is in contrast to the current definition, adopted in 1971, which relies on the mass of the kilogram. The new definition comes in advance of the anticipated revision of SI, announced in 2011 by the General Conference on Weights and Measures of the Bureau International des Poids et Mesures (BIPM), the international body responsible for the global comparability of measurements. The new SI will link all seven base units to fundamental physical constants. In November 2018, revised definitions of the kilogram, ampere, kelvin, and mole are expected to be approved by the CGPM. The revised definitions are expected to come into force on World Metrology Day, 20 May 2019.

https://doi.org/10.1515/pac-2017-0106

On the future revision of the SI

At its 25th meeting (November 2014) the CGPM adopted a Resolution on the future revision of the International System of Units. This Resolution built on the CGPM's previous Resolution (2011), which took note of the CIPM's intention to propose a revision of the SI and set out a detailed roadmap towards the future changes.

In the revised SI four of the SI base units—namely the kilogram, the ampere, the kelvin and the mole—will be redefined in terms of constants; the new definitions will be based on fixed numerical values of the Planck constant (*h*), the elementary charge (*e*), the Boltzmann constant (k_B), and the Avogadro constant (N_A), respectively. Further, the definitions of all seven base units of the SI will also be uniformly expressed using the explicit-constant formulation, and specific mises en pratique will be drawn up to explain the realization of the definitions of each of the base units in a practical way.

https://www.bipm.org/en/measurement-units/rev-si/