



Kg Gets a New Definition

At the General Conference on Weights and Measures (CGPM) in Versailles (France), delegates of International Bureau of Weights and Measures (BIPM) voted to **redefine the kilogram** in terms of a tiny but unchanging value called the "**Planck constant**".

- The new definition involves an apparatus called the **Kibble balance**, which makes use of the constant to measure the mass of an object using a precisely measured electromagnetic force.
- They also voted to update definitions for the ampere (the unit of electrical current), the Kelvin (the unit of temperature) and the mole (amount of a substance).
- The new definitions agreed by the BIPM will come into force from **May 20, 2019**.

Background

- Since the 19th century, scientists have based their definition of the fundamental unit of mass on a physical object — **a shining platinum-iridium cylinder or Le Grand K (weighed exactly a kilogram)** known as the **International Prototype of the Kilogram**.
- It is housed at the headquarters of BIPM in Sevres, France.
- All modern mass measurements are derived from the kilogram, whether micrograms of pharmaceutical medicine or gold dust, kilos of fruit or fish or tonnes of steel.
- The problem is the **prototype doesn't always weigh the same**. Even inside its three glass bell jars it **picks up microparticles of dirt** and is affected by the atmosphere. Sometimes it needs cleaning, which **can affect its mass**.

New Concepts

- Since 1967, **the second** has been defined as the **time it takes for a certain amount of energy to be released as radiation from atoms of Caesium-133**. This became the basis of all measures of time and is used in **atomic clocks**.
- Once the second was defined, **the metre** fell into place. This was based on another universal constant: the speed of light. Today, **the metre** is defined as **the distance travelled by light in vacuum in 1/299,792,458 of a second** (which is already defined).
- The kilogram comes next. **The Planck constant**, which Kilogram is based on, is **usually measured in joule seconds**, but this can also be **expressed as kilogram square metres per second**.
- By adding measurements of a second and a metre, along with an exact knowledge of Planck's constant, precise definition of the kilogram can be obtained.

Conclusion

- The new definition of the second helped ease communication across the world via technologies like GPS and the Internet. In the same way, experts say the change in the kilogram will be better for technology, retail and health.
- In daily life, however, the new SI units will have little immediate practical consequence.
- Defining the units based on physical constants means that scientists will be able to measure them at any place or time, and on any scale.
- This will pave the way for far **more accurate measurements** and lays a more stable foundation for science.

BIPM and CGPM

- The **Metre Convention** is the treaty that created **the International Bureau of Weights and Measures (BIPM)**, an **intergovernmental organization** under the authority of the **General Conference on Weights and Measures (CGPM)** and the supervision of the International Committee for Weights and Measures (CIPM).
- The Convention was signed in Paris on 20 May 1875 by representatives of seventeen nations. The Metre Convention established a permanent organizational structure for member governments to act in common accord on all matters relating to units of measurement.
- **In 1889 the 1st CGPM sanctioned the international prototypes for the metre and the kilogram.** Together with the astronomical second as the unit of time, these units constituted a three-dimensional mechanical unit system similar to the CGS system (centimetre-gram-second system).
- Following an international inquiry by the BIPM, which began in 1948, the 10th CGPM, in 1954, approved the introduction of the ampere, the Kelvin and the candela as base units, respectively, for electric current, thermodynamic temperature and luminous intensity.
- The name **International System of Units**, with the abbreviation SI, was given to the system by the **11th CGPM in 1960**.
- At the 14th CGPM in 1971, after lengthy discussions between physicists and chemists, the current version of the SI was completed by adding the mole as the base unit for amount of substance, bringing the total number of base units to seven.
- **India** became a signatory to the General Conference on Weights and Measures (CGPM) in 1957.
- As of 7 August 2018, there are **60 Member States of BIPM including India**.

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