

Come 2019, the kilogram will get a new measure

Global metrology experts decide to drop traditional system

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In 2019, the kilogram will get more accurate. For 125 years, a salt-shaker-sized cylinder housed at the Bureau International des Poids et Mesures (BIPM), Paris and weighing exactly a kilogram served as the definition of the measure. India's National Physical Laboratory too has a replica of this, since 1957, and it has served as the reference for a variety of industries to keep their weights accurate.

However an international conference of heads of metrology institutes decided, on October 19 in Sevres, France, that the kilogram will no longer be pegged to this cylinder made of 90% platinum and 10% iridium.

In the last 60 years, several standard units – the second, metre, ampere, Kelvin, mole, candela and, the kilogram – have all ceased to be defined by physical objects.

One metre, for instance, was a platinum-iridium bar of that measure. In 1960, the metre was defined as the



A platinum bar used as a reference standard.

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distance travelled by light in vacuum in $1/299,792,458$ seconds.

No more artefacts

In essence, the units were freed from being defined on the basis of artefacts, as these being objects, were subject to wear and tear and sources of eventual error. The new artefacts, according to the International Committee for Weights and Measures, ought to derive from the constants of nature that are all interdependent.

These include constants such as the Planck constant – the ratio of the electro-

magnetic radiation from a photon to its frequency – and the charge of an electron.

Until this month, the kilogram was the only one among the units still pegged to a real object and now – after a formal vote in 2018 – the world is set to redefine the kilogram in terms of the Planck constant, the second and the metre.

Kibble balance

The undoing of the cylinder has been the Kibble balance.

It is a set of scales, which uses the force produced by a current-carrying wire in a magnetic field to balance the weight of a mass.

Through this, accurate measures of the Planck constant – the fulcrum of several of the standard units – can be made.

“At the level of large objects nothing changes,” said Dinesh Aswal, Director, NPL and India's representative at the conference, “But when measures at the level of micrograms need to be made such as in preparing drugs, these errors hugely matter.”