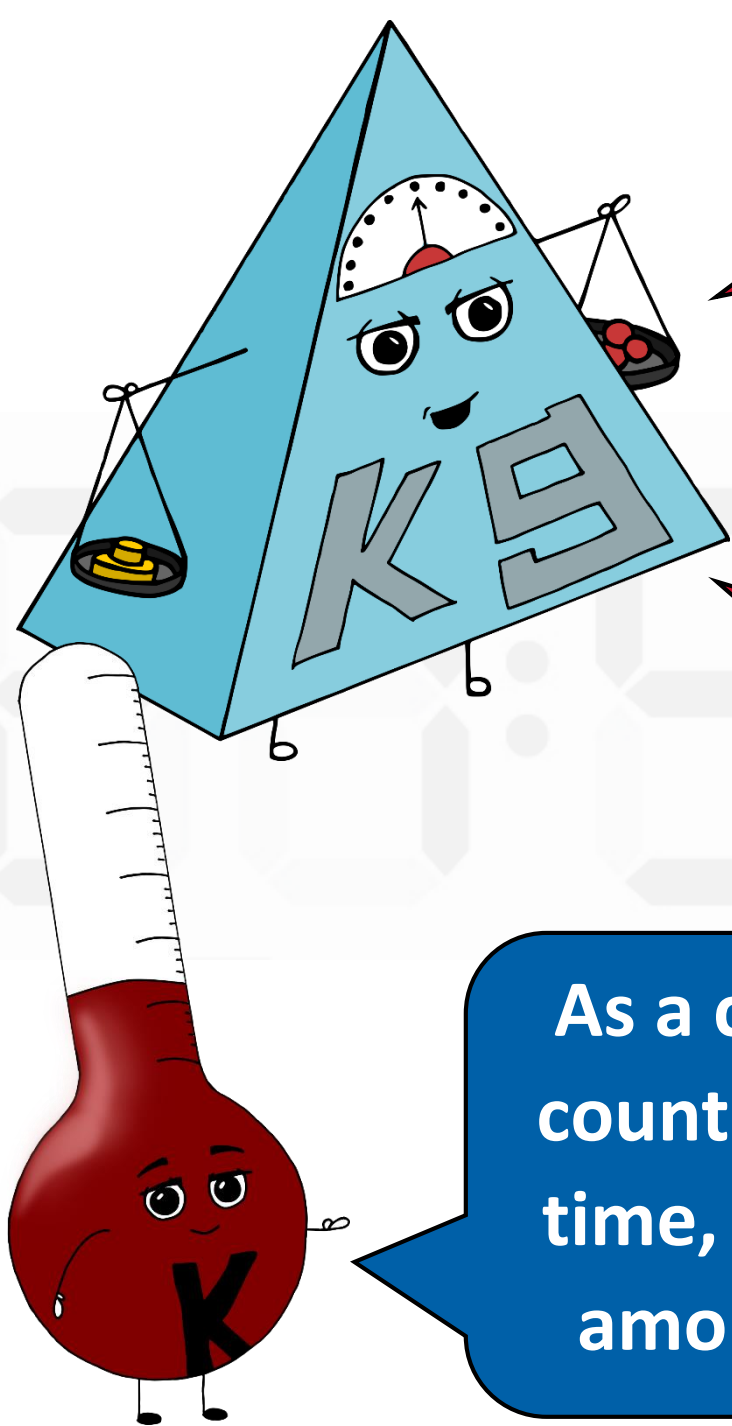


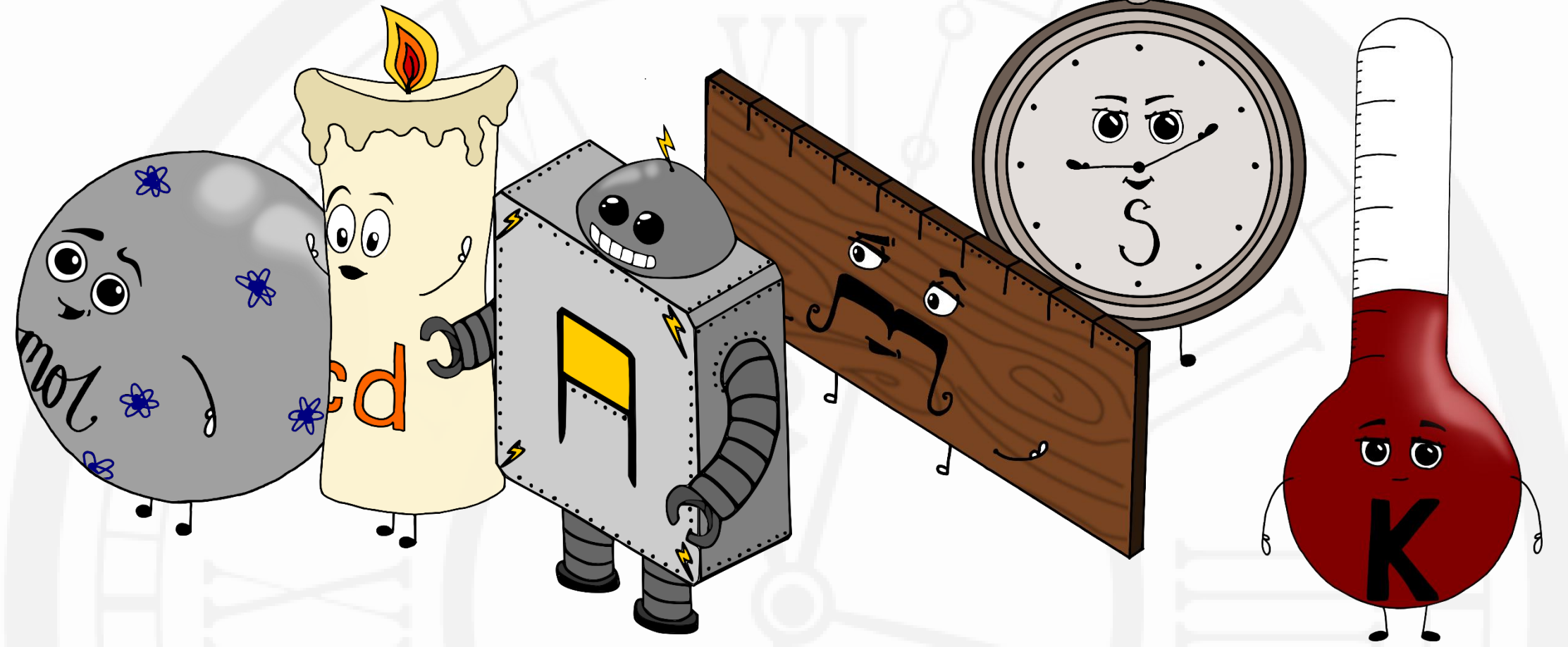
Revision of the SI base units



Did you know that we have been revised?

Revised? But why?

You first need to understand where the SI units came from.



As a consequence of there being many different units in use around the world, in 1875 a number of countries agreed to the "Convention of the Metre" which declared a standard set of units for length, time, and mass, the so called Metric System. Units for electric current, temperature, luminosity, and amount of substance were introduced in later years to form the International System of Units (SI).



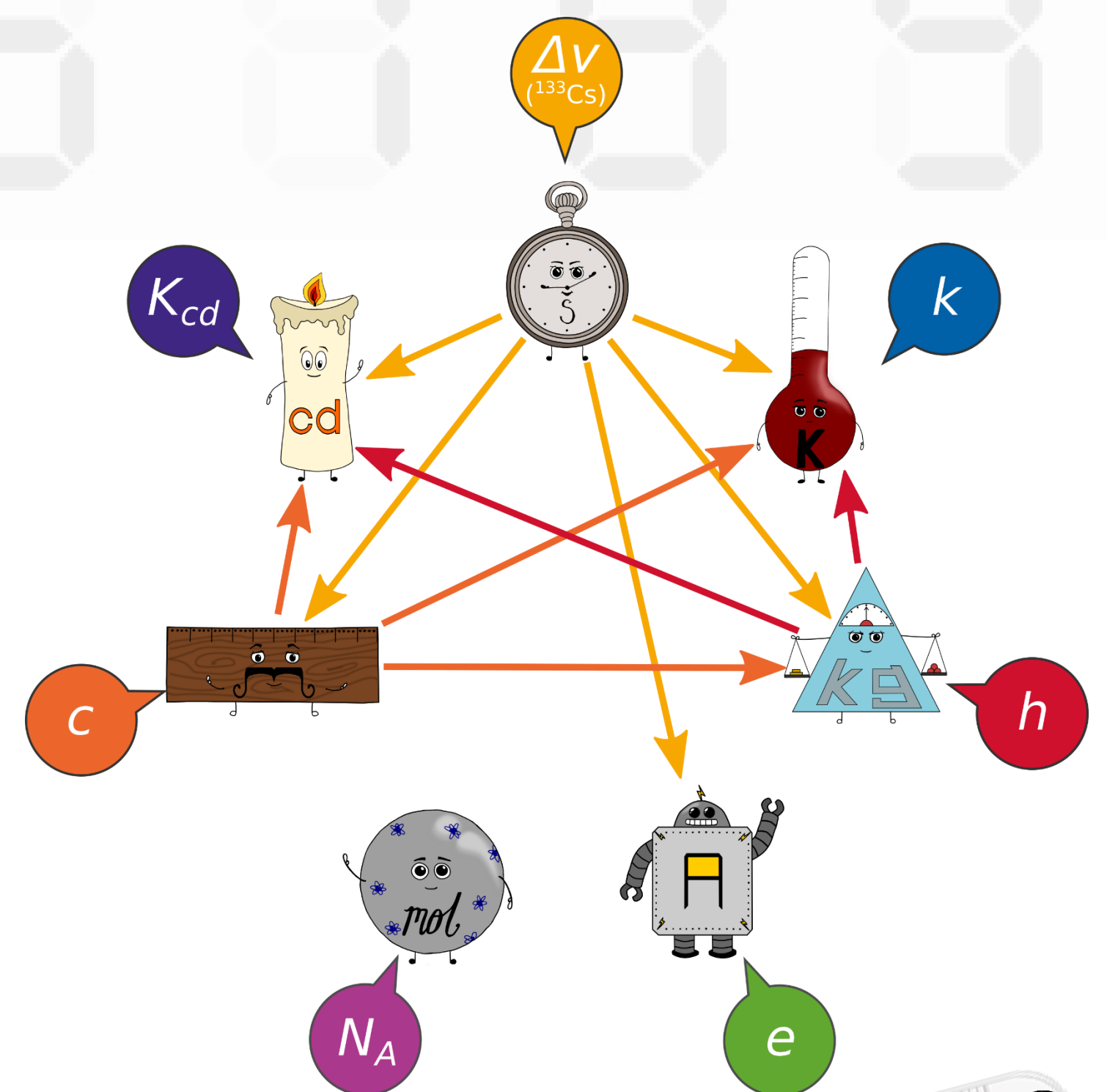
Some of the units used to have reference to physical artefacts, the most famous being the International Prototype of the Kilogram (IPK), which was held in a vault in Paris. The problem with using a physical artefact to define the unit, is that it is subject to changes in properties over time. Since the creation of the IPK in 1889 variations in environmental conditions caused the mass to change, so the definition of the kilogram was linked to something that was unstable over long periods of time.

In the revised SI the new definitions are based on seven of the most important fundamental constants of nature, which are now known to a very high precision. Each of the constants is linked to one or more of the seven SI base units.

Scientists can now measure the seven SI base units with ever increasing accuracy and precision, as more advanced experiments and technologies are designed.

The famous physicist Max Planck made this extraordinary statement in 1927 about linking the measurement units to constants of nature, that "they will necessarily retain their validity for all times and cultures, even extra-terrestrial and nonhuman."

$\Delta\nu(^{133}\text{Cs}) = 9\,192\,631\,770\text{ s}^{-1}$ (Hz) unperturbed ground state hyperfine transition frequency of the caesium-133 atom
$c = 299\,792\,458\text{ m s}^{-1}$ speed of light in vacuum
$h = 6.626\,070\,15 \times 10^{-34}\text{ kg m}^2\text{ s}^{-1}$ (J s) Planck constant
$k = 1.380\,649 \times 10^{-23}\text{ kg m}^2\text{ K}^{-1}\text{ s}^{-2}$ (J K ⁻¹) Boltzmann constant
$e = 1.602\,176\,634 \times 10^{-19}\text{ A s}$ (C) elementary charge
$K_{cd} = 683\text{ cd kg}^{-1}\text{ m}^{-2}\text{ s}^3$ (lm/W) luminous efficacy of monochromatic radiation of frequency $540 \times 10^{12}\text{ Hz}$
$N_A = 6.022\,140\,76 \times 10^{23}\text{ mol}^{-1}$ Avogadro constant



Practical measurement in every aspect of our lives, from everyday activities, to science and engineering to medicine, to trade and industry, all of it, now has reference to a scale defined by nature, through the fundamental constants.