1.39e+24 and The Pfund Mass $= \sqrt{\frac{10^{-14}\ q_e^4\ c^3}{G}} = M_F$

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Using $\frac{q_e}{coulomb}\frac{kg \cdot m^2}{s^2} = eV = 1.602176634 \times 10^{-19} J =$ the ElectronVolt; units of Mass $= \frac{eV}{c^2}$, Length $= \frac{\hbar c}{eV}$, or Time $= \frac{\hbar}{eV}$ can be constructucted. Maybe we can do better:

$$\frac{\hbar}{cM_F} = L_F = \frac{\hbar\ c}{E_F}; \qquad \frac{\hbar}{c^2 M_F} = T_F = \frac{\hbar}{E_F}; \qquad q_e = Q_F$$

$$k_e = \ \alpha\ M_F^1 L_F^3 T_F^{-2} Q_F^{-2} \qquad \hbar = \ 1\ M_F^1 L_F^2 T_F^{-1}$$

$$\mu_0 = \ \alpha\ 4\ \pi\ M_F^1 L_F^1 Q_F^{-2} \qquad c = \ 1\ L_F^1 T_F^{-1}$$

$$\epsilon_0 = \ \frac{1}{\alpha\ 4\ \pi}\ M_F^{-1} L_F^{-3} T_F^2 Q_F^2 \qquad N_A = \ 1^{**}$$

$$M_F\ c^2 = E_F = \ 1\ M_F^1 L_F^2 T_F^2$$

$$R_\infty = \frac{m_e}{M_F}\frac{\alpha^2}{4\ \pi}\ L_F^{-1} \qquad \frac{2\ \pi\ \hbar}{c\ q_e} = k_b = \ 2\pi\ M_F^1 L_F^1 Q_F^{-1}$$

** only way to correct N_A being based on the Dalton $= \frac{1}{12}$ the mass of Carbon isotope C^{12} is to correct the periodic table to use the Pfund Mass $= M_F$ like the example to the right.

1 Dimensionality

Stoney-Mass $M_S = \sqrt{\frac{\hbar\ \alpha\ c}{G}}$ dimensions are correct but $M_F = M_S\sqrt{\hbar\alpha}$ it does mess up the dimensions, but the numbers make all the equations above work, need to do some math and maybe some powers of α & other constants can get rid of the $1M^{1/2}L^1T^{-1/2}$.

$$\hbar\ \alpha^2 = \frac{10^{-14} Q_F^4}{M_F T_F} = \frac{G}{M_F^3 L_F^{-1} T_F^{-2} Q_F^0}$$

Only unit with wrong dimensionality is G, but the arithmetic is correct; for correct dimensionality M_F needs to be multiplied times $\sqrt{\frac{T}{M\ L^2}}$(this also goes the reciprocal of L_F and T_F). Does gravity exist, or is it just the curvature of space time?

$$2\ \pi\ 10^{-7} = \frac{\mu_0}{2}\frac{Q^2}{M\ L} = \frac{Q^2}{M\ L}\frac{\hbar\ \alpha}{c\ q_e^2};\ \ k_e = \frac{\hbar\ \alpha}{c\ q_e^2}\frac{c^2}{2\pi};\ \ \epsilon_0 = \frac{1}{\mu_0 c^2}$$

$$\frac{\mu_0}{2}\frac{c\ q_e^2}{2\ \pi\ \hbar} = \frac{2\ \pi\ 10^{-7}\ 299792458\ (1.602176634 \times 10^{-19})^2}{6.62607015 \times 10^{-34}} = \alpha$$

$= 0.00729735257$ - "It has been a mystery ever since it was discovered more than fifty years ago, and all good theoretical physicists put this number up on their wall and worry about it."[Feynman, 1985, p. 129]. $\qquad k_e = 10^{-7}\ c^2\frac{T^2}{L^2}\frac{M\ L^3}{T^2\ Q^2}$

*e-mail: r0ypfund@gm41l.c0m

2 Speed of Sound = c_0

Given $c_0 = \sqrt{\frac{\gamma_0 N_A k_B T}{M}}$ and $39.947g\ mol^{-1}$ = molar mass of the argon gas from the experiment measuring c_0 in a purifed isotope of argon gas at the Triple-Point of water = 273.16K [dePodesta et al., 2013] Where $U_F = \frac{E_F}{k_b}$, $T = \frac{Kelvin}{U_F}U_F$, and $\gamma_0 = 5/3$ for monotonic gases. Let's see how that matches up with the $c_0^2 = 94756.245m^2s^-2$ from the experiment in 2013.

$$c_0 = \sqrt{\frac{\frac{5}{3}\ 1\ k_B\ \frac{273.16Kelvin}{U_F}\ U_F}{40.671 M_F}} = 307.701ms^{-1} \approx \sqrt{c_0^2}$$

$$\text{**adjusted argon gas molar mass} = 40.671 M_F = \frac{39.947}{M_F\ N_A}$$

3 Time is On Our Side(& Distance)

With a Sympathetic Constant = D_C = light-second / L_F to save our wallets, watches, measuring wheels, and road signage we can still use existing definitions of distance and time.

$$\frac{1.3899982e+24 \approx \frac{c\ T_{SI}}{L_F} = D_C}{1.39e+24} = 0.999998675$$

Perhaps one day for the sake of simplicity, Bureau international des poids et mesures might redefine the second and meter such the D_C is exactly 1.39e+24 rather than approx. 5 almost 6 nines.

4 Conclusion

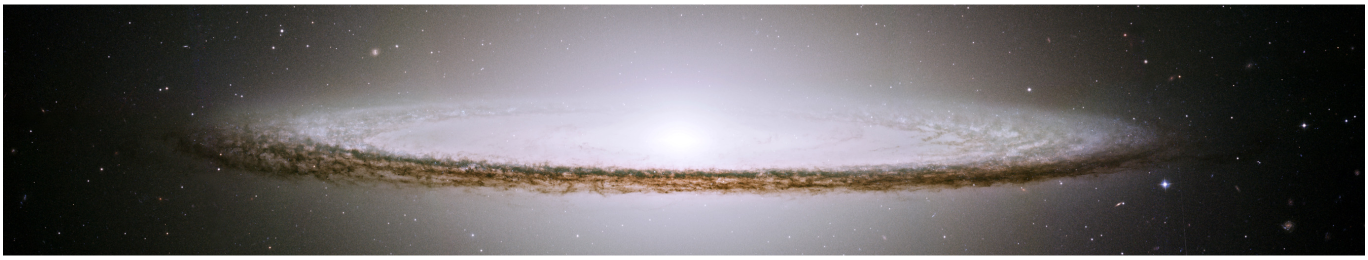
Remember all wallets, watches, measuring wheels, and road signage are already calibrated to D_C and After the dust settles and all scales and ammeter are calibrated, all that will have to be remembered besides preserving dimensionality when doing calculations is the following:

$$222702.257\text{Coulumbs} \qquad = D_C\ Q_F$$

$$\frac{\hbar}{c^2 M_F}\ D_C = 1\text{Second} \qquad = T_F\ D_C$$

$$\frac{\hbar}{cM_F}\ \frac{D_C}{299792458} = 1\text{Meter} \qquad = L_F\ \frac{D_C}{299792458}$$

$$2.267061\text{grams} \approx 1\text{Pfund}\ \frac{c\ T_{SI}}{L_F} \qquad = M_F\ D_C$$



5 Constants

$$\text{Avogadro constant } N_A = 6.02214076 \times 10^{26} \frac{\text{atoms per kg}}{\text{molar mass}}$$
$$\text{Planck constant } h = 6.62607015 \times 10^{-34} kg\ m^2\ s^{-1}$$
$$\text{lightspeed constant } c = 299792458\ m\ s^{-1}$$
$$\text{electron charge } q_e = 1.602176634 \times 10^{-19} \text{Coulumbs}$$
$$\text{gravity constant } G = 6.67430 \times 10^{-11} kg^{-1} m^3 s^{-2}$$

On May 20, 2019 the values of N_A, $\hbar = \frac{h}{2\pi}$, and h, were fixed to the Dalton $= \frac{1}{12}$ the mass of Carbon isotope C^{12} [Bettin]. $s =$ "duration of 9192631770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium 133 atom"[SI, 1968] to finish the definition of c, An international agreement in Paris on Oct. 20 1983 defines the meter as $\frac{1}{299792458}$ the distance light travels in a vacuum in 1 second[Times, 1983],

[Tiesinga et al., 2021] gives us q_e, and G. Just don't forget Milikan's Oil Drop or the Cavendish Mitchell Device.

5.1 How the Avogadro constant was measured for the last time

N_A and h were measured using a incredibly round & pure ball of Si^{28} and a Kibble balance and the equations basically verbatim from [Bettin] and [Wood and Bettin, 2019] Where $\alpha^2\ m_e\ c\ /\ 2\ h = R_\infty$ is the Rydberg constant, $\sum_{i=28}^{30} x_i\ A_r({}^iSi) = A_r(Si)$ average molar mass of a silicon atom in the crystal is calculated using the proportions x_i of the various isotopes ${}^iSi$, V is Volume of Silicon Sphere, a Lattice parameter of the silicon crystal, 8 is the number of atoms in an elementary cell of the lattice(cube with edge length a). M Molar mass of silicon contained in sphere. m mass of sphere.

$$N = \frac{8\ V}{a^3} = \text{Number of atoms in silicon sphere}$$
$$N_A = \frac{M\ 8\ V}{m\ a^3} = \text{Avogadro constant}$$
$$m(Si) = \frac{m}{N} = \frac{m\ a^3}{8V} = m(e)\frac{A_r(Si)}{A_r(e)}$$
$$m(e) = \frac{2\ h\ R_\infty}{c\ \alpha^2} = \frac{2\ (2\pi\ \hbar)\ R_\infty}{c\ \alpha^2}$$
$$h = \frac{c\ \alpha^2}{2R_\infty}\frac{m\ a^3}{8\ V}\frac{A_r(e)}{\sum_{i=28}^{30} x_i\ A_r({}^iSi)}$$

References

Horst Bettin. How the avogadro constant was measured for the last time. URL `https://q-more.chemeurope.com/q-more-articles/287/how-the-avogadro-constant-was-measured-for-the-last-t` `html`.

Michael dePodesta, Robin Underwood, Gavin Sutton, Paul Morantz, Peter Harris, Darren F Mark, Finlay M Stuart, Gergely Vargha, and Graham Machin. A low-uncertainty measurement of the boltzmann constant. *Metrologia*, 50(4): 354–376, jul 2013. doi: 10.1088/0026-1394/50/4/354. URL `https://doi.org/10.1088/0026-1394/50/4/354`.

Richard Feynman. *QED : the strange theory of light and matter*. Princeton University Press, Princeton, N.J, 1985. ISBN 978-0-691-08388-9.

SI. *CGPM13 CGPM : Comptes rendus de la 13e réunion (1968)*. Bureau international des poids et mesures, F-92312 Sèvres Cedex, France, 1968. URL `https://www.bipm.org/documents/20126/17314988/CGPM13.pdf/ff522dd4-7c97-9b8d-127b-4fe77f3fe2bc?version=1.2&t=1587104721230&download=true#page=103`.

George Johnstone Stoney. On the physical units of nature. *The Scientific Proceedings of the Royal Dublin Society*, 3:51–60, 1883. URL `https://books.google.com/books?id=R79WAAAAIAAJ&pg=PA51`.

Eite Tiesinga, Peter J. Mohr, David B. Newell, and Barry N. Taylor. Codata recommended values of the fundamental physical constants: 2018. *Rev. Mod. Phys.*, 93:025010, Jun 2021. doi: 10.1103/RevModPhys.93.025010. URL `https://link.aps.org/doi/10.1103/RevModPhys.93.025010`.

NY Times. Science watch. *NY Time*, page 6, Nov 1983. URL `https://www.nytimes.com/1983/11/01/science/science-watch-011004.html`.

Barry Wood and Horst Bettin. The planck constant for the definition and realization of the kilogram. *Annalen der Physik*, 531(5):1800308, 2019. doi: https://doi.org/10.1002/andp.201800308. URL `https://onlinelibrary.wiley.com/doi/abs/10.1002/andp.201800308`.

Supplementary Materials

This was originally some notes on how the Planck-Units, and the Stoney-Units[Stoney, 1883], baked out the need for certain constants. Stoney-Mass $M_S = \sqrt{\frac{\hbar\ \alpha\ c}{G}}$ dimensions are correct but $M_F = M_S\sqrt{\hbar\alpha}$ it does mess up the dimensions, but the numbers cancel like a million things out. Only reason I knew about it was I had avogadro constant for Stoney-Mass mass popping up to do the speed of sound calc to see how the planck units canceled out the Boltzman constant, and I saw the Avogadro constant for M_S and for some reason or another I had just looked at $\sqrt{\hbar\alpha}$. Hopefully this unit system will bring α in front of more eyes.