

$$\frac{2.267061\text{grams}}{1.39\text{e}+24} \approx \sqrt{\frac{k_e^2 q_e^4 T}{c G M L^2}} = \sqrt{\frac{c \hbar^2 \alpha^2 T}{G M L^2}} = M_F$$

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## 1 Dimensionality

Stoney-Mass  $M_S = \sqrt{\frac{\hbar \alpha c}{G}}$  dimensions are correct but  $M_F = M_S \sqrt{\hbar \alpha}$  gives correct arithmetic for all the equations below to work but to correct dimensions, that's where the  $M^{-1/2} L^{-2/2} T^{1/2} = \frac{1}{\sqrt{\frac{M^1 L^2}{T}}}$  comes from.

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

but it comes back in the solution for  $G$ . However  $G$  is wrong to begin with, because with Relativity it doesn't really exist, as it is the curvature of space time. Might help us understand  $\alpha$ ?

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

$$\frac{\mu_0}{2} = \frac{\hbar \alpha}{c q_e^2}; \quad \frac{\hbar \alpha}{c q_e^2 2\pi} = k_e; \quad \epsilon_0 = \frac{1}{\mu_0 c^2}$$

= 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]. **Let's put it everywhere.**

$$\sqrt{\frac{T_F}{M_F L_F^2} \frac{G}{M_F^3 L_F^{-1} T_F^{-2}}} = \alpha$$

## 2 Speed of Sound = $c_0$

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

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

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

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## 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.

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

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

I could go on about how some CFD software uses planck units to reduce computation by reducing the billions of multiplications of  $k_b$ ; we should care about people as much as machines and reduce the constants people have to know. Remember all wallets, watches, measuring wheels, and road signage are already calibrated to  $D_C$  and After the dust settles and all scales are calibrated to  $D_C M_F$  and ammeter are calibrated to  $D_C q_e$ , all that will have to be remembered besides preserving dimensionality when doing calculations is the following:

$$\frac{\hbar}{c^2 M_F} = T_F \approx \frac{1 \text{ Second}}{1.39\text{e}+24}; \quad Q_F \approx \frac{222702.257 \text{ Coulombs}}{1.39\text{e}+24}$$

$$\frac{\hbar}{c M_F} = L_F \approx \frac{299792458 \text{ Meters}}{1.39\text{e}+24}$$

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

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

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

$$R_\infty = \frac{m_e}{M_F} \frac{\alpha^2}{4 \pi} L_F^{-1} \quad M_F c^2 = E_F = 1 M_F^1 L_F^2 T_F^2$$

$$\frac{2 \pi \hbar}{c q_e} = k_b = 2 \pi M_F^1 L_F^1 Q_F^{-1}$$

\*\* 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 sound-speed example.



## 5 Constants

Avogadro constant  $N_A = 6.02214076 \times 10^{26} \frac{\text{atoms per kg}}{\text{molar mass}}$

Planck constant  $h = 6.62607015 \times 10^{-34} \text{kg m}^2 \text{s}^{-1}$

lightspeed constant  $c = 299792458 \text{m s}^{-1}$

electron charge  $q_e = 1.602176634 \times 10^{-19} \text{Coulombs}$

gravity constant  $G = 6.67430 \times 10^{-11} \text{kg}^{-1} \text{m}^3 \text{s}^{-2}$

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] Where  $\alpha^2 m_e c / 2 h = R_\infty$  is the Rydberg constant,  $\sum_{i=28}^{30} x_i A_r(i Si) = A_r(Si)$  average molar mass of a silicon atom in the crystal is calculated using the proportions  $x_i$  of the various isotopes  $i Si$ ,  $V$  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.

$$N = \frac{8 V}{a^3} = \text{Number of atoms in silicon sphere}$$

$$N_A = \frac{M 8 V}{m a^3} = \text{Avogadro constant}$$

$$m(Si) = \frac{m}{N} = \frac{m a^3}{8 V} = m(e) \frac{A_r(Si)}{A_r(e)}$$

$$m(e) = \frac{2 h R_\infty}{c \alpha^2} = \frac{2 (2\pi \hbar) R_\infty}{c \alpha^2}$$

$$h = \frac{c \alpha^2 m a^3}{2 R_\infty 8 V} \frac{A_r(e)}{\sum_{i=28}^{30} x_i A_r(i Si)}$$

## References

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## Supplementary Materials

Only reason I found this was for some reason or another I had just looked at  $\sqrt{\hbar \alpha}$ , and I had Avogadro constant for Stoney-Mass  $M_S = \sqrt{\frac{\hbar \alpha c}{G}}$  mass popping up in a script I had running with some notes to see how the Planck-Units, and the Stoney-Units[Stoney, 1883], baked out the need for certain constants. But when I had left the speed of sound calc to see how the planck units canceled out the Boltzman constant, and the Avogadro constant for  $M_S$  also popped up, not exact match but so close I had to do more tests.