

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

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

$$\begin{aligned} \frac{\hbar}{c M_F} &= L_F = \frac{\hbar c}{E_F}; & \frac{\hbar}{c^2 M_F} &= T_F = \frac{\hbar}{E_F}; & q_e &= Q_F \\ k_e &= \alpha M_F^1 L_F^3 T_F^{-2} Q_F^{-2} & \hbar &= 1 M_F^1 L_F^2 T_F^{-1} \\ \mu_0 &= \alpha 4 \pi M_F^1 L_F^1 Q_F^{-2} & c &= 1 L_F^1 T_F^{-1} \\ \epsilon_0 &= \frac{1}{\alpha 4 \pi} M_F^{-1} L_F^{-3} T_F^2 Q_F^2 & N_A &= 1^{**} \\ R_\infty &= \frac{m_e}{M_F} \frac{\alpha^2}{4 \pi} L_F^{-1} & M_F c^2 &= E_F = 1 M_F^1 L_F^2 T_F^2 \\ & & \frac{2 \pi \hbar}{c q_e} &= k_b = 2 \pi M_F^1 L_F^1 Q_F^{-1} \end{aligned}$$

\*\* 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  $\alpha$  & other constants can get rid of the  $1 M^{1/2} L^1 T^{-1/2}$ .

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

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?

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

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

= 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].

$$k_e = 10^{-7} c^2 \frac{T^2}{L^2} \frac{M}{T^2} \frac{L^3}{Q^2}$$

\*e-mail: r0ypfund@gm411.c0m

## 2 Speed of Sound = $c_0$

Given  $c_0 = \sqrt{\frac{\gamma_0 N_A k_B T}{M}}$  and  $39.947 g \text{ mol}^{-1}$  = 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  $c_0^2 = 94756.245 m^2 s^{-2}$  from the experiment in 2013.

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

\*\*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.

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

$$2.267061 \text{ grams} \approx M_F D_C$$

$$q_e 1.39\text{e}24 \approx 222702.257 \text{ Coulombs} \approx Q_F D_C$$

## 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:

$$\begin{aligned} \frac{q_e 1.39\text{e}24}{1.000001324999} &\approx 222702.257 \text{ Coulombs} &= D_C Q_F \\ \frac{\hbar}{c^2 M_F} D_C &= 1 \text{ Second} &= T_F D_C \\ \frac{\hbar}{c M_F} \frac{D_C}{299792458} &= 1 \text{ Meter} &= L_F \frac{D_C}{299792458} \\ 2.267061 \text{ grams} &\approx 1 \text{ Pfund} \frac{c T_{SI}}{L_F} &= M_F D_C \end{aligned}$$

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  $1.39\text{e}+24$  rather than approx. 4 almost 5 nines.



## 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] 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.

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

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

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

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

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

## References

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## 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  $\alpha$  in front of more eyes.