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Title

A Mathematical Way to Derive Values for the Universal Constants relating them to the fine structure constant alpha, (a), as a Continuous Equation Involving pi, (π), and the Square Root of 10.

By

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Abstract

The fine structure constant, α, is an integral part of all constants involving mass and matter, if not in whole then in part or fractional exponents. The only constants lacking the fine structure constant are the 'elementary charge, *e,*' and the 'permeability of a vacuum, μ_o'. It is also apparent that according to the 2014 NIST values for all the universal constants if alpha changes over time then so will all the universal constants change proportionally. The changes range from one tenth to three one-thousandths, or smaller, of one percent of the values found in the 2014 CODATA Bulletin.

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Main Text

In the online publication of Nature Journal on 23 August 2010 there was an article entitled *G-Whizzes Disagree over Gravity.* In this article, it states that metrologists are having trouble agreeing over the constant of *G* in gravity and that a new value may be in the making. The significance of the following paper becomes obvious for setting a standard for all constants to compare with the measured values. For instance, if we accept the value for the fine structure constant as set forth in this paper as $7.294848617\ldots \times 10^{-3}$, which represents a .034% decrease of the standard accepted value, or by using fractions of π we will find the metrologists' measured values for *G*; 6.67234×10^{-11}; 6.67349×10^{-11}; and 6.674215×10^{-11}; to exist between $1/\alpha^{.5}B^{20.5}\pi^{1.999826}$ and $1/\alpha^{.5}B^{20.5}\pi^{1.9995814}$ respectively, which represents a .0198% through a .0479% decrease from their value to ours or also by using the fine structure constant, α, similarly $6.674215\ \xi\ 10^{-11} = 1/\pi^2B^{20.5}\alpha^{.500097379}$; as compared to *G* in this paper at $1/\alpha^{.5}B^{20.5}\pi^2$ which equals $6.671018003\ldots \times 10^{-11}$.

I was curious about the mysterious 1.37×10^2 when I decided to use it as an exponent of π. However, I first used the basic 1.37094, a number that I derived from the standard values being used in 1987. It was then that I noticed that the number was close to the numerical value of the electrostatic unit, (4.803×10^{-10} esu), only proportionally different. While I was working out the proportionality part of the equation, I found that $1.37094(p^{2(137094)})$ was remarkably close to the value of the

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square root of ten times one hundred or one thousand. It was only a simple matter of trial and error to work out the final equation.

Deciphering the Avogrado's number was a little trickier. I began by using Einstein's photoelectric equation where he formulated the maximum-energy to be equal to Boltzman's constant [k or (R/N_A)], times some constant b, times the frequency ν, all minus the work function ϕ, $E_{max} = (R/N_A)b\nu - \phi) = h\nu$. In knowing this I had to first find the constant times the Boltzman's constant, and I could then start looking for the solution to the Avogradro's number. Since I already had an exact Planck's constant, I could find the exact constants for all the others by a little reason and insight. I started by dividing the exact Planck's constant by the standard accepted Boltzman's constant, $[h/(R/N_A)$. Surprisingly, this rendered a number that was close to $4.8x10^{-11}$, but not exactly. Because of some previous research $4.8x10^{-11}$ was a number familiar to me. So, I simply divided the exact Planck's constant by this number, and it produced $1.380704525 \times 10^{-23}$. A number so close to the standard accepted Boltzman's constant that I believe it to be the correct one.

This number, 4.8×10^{-11}, comes from some previous research I was doing concerning the velocity of gravity. Disallowing the standard accepted belief of the upper limit of velocities being the velocity of light, I wondered, "If gravity were a field of gravitons and gravitons could transit the distance of the classical radius of the electron in the same time electromagnetic energy could transit the

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Schwarzschild's radius of the electron, what would be its velocity?" Truly I know an electron does not have a critical radius, but this is just a theoretical proposition. It turns out to be the same for any mass of any size and is a constant as well. It is 6.25 x 10^{52} c/s and 6.25 x 10^{50} m/s. This number divided by three, the number of linear dimensions, and inverted is equal to 4.8 x10^{-53} c/s and (10^{-51}) m/s. The uniqueness leads me to believe b = 4.8 x 10^{-11}. Now I had an exact Boltzman's constant, (h_{exact}/b_{exact}) and an exact ratio between the gas molar constant and the Avogadro's number.

It was the molar volume of an ideal gas and the Loschmidt constant, n_o, that yielded the equation I was searching for to define an exact gas molar constant, R. Once I had the gas molar constant, I could find the exact Avogrado's number. First, I found that the pressure (p) divided by the temperature (T) divided by the exact Boltzman's constant (k_{exact}) would give an exact Loschmidt's constant because all the numbers are exact, (p/Tk_{exact}) = 2.686672065 x 10^{25}. This too was a lucky accident. Since R is equal to N_Ak, and RT/p is also equal to N_AkT/p, I entered $k_{exact}T/p$ into my calculations. I noticed that this formula inverted was equal to an exact Loschmidt's constant, since I was using the exact k, and both p and T are exact. Therefore, if I used the Loschmidt's constant with the exact values combined with the standard accepted values I could find the ratio of the standard to the exact. Since $N_A/V_m = (R/k)_A/RT/p)_m$ and also equals n_o, I was in the position to formulate

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the following equation: if $R_{exact}T/p = V_{m(\ exact)}$, then

$$Rp/Tk = R_{exact}n_o,$$

And because p/Tk_{exact}, using the exact values, equals the exact Loschmidt's constant, $n_{o(exact),}$, we have

$$R\ n_{o(exact)} = R_{exact}\ n_o$$

And

$$[R\ n_{o(exact)}]/n_o = R_{exact} = 8.314228579 \text{ J mol}^{-1} \text{ K}^{-1}.$$

Dividing the R_{exact} by the Boltzman's constant, k_{exact}, gives the exact Avogrado's number, $N_{A(exact)} = 6.021729077 \times 10^{23}$, which varies slightly from the standard accepted value for Avogrado's number which is $6.0221367(36) \times 10^{23}$. However, both rounded off to the most significant figure are still 6.022×10^{23}, the most commonly used value.

Since then I have found that by using a method, I call the *"a-B-π"* method I can approximate all the constants. (The reason I used *B* as the designation for the square root of ten is because I did not find it used prominently among the universal constants). We are now in position the establish the Universal constants

In the following body of this text, a method is demonstrated for deriving the fundamental universal constants from three pure non-dimensional numbers. The fine structure constant, α, is shown to be a continuous equation using pi, π, and the square

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root of ten, $10^{1/2}$. Using the fine structure constant, pi, and the square root of ten taken to different exponential values, most, if not all the accepted fundamental universal constants can be found.

The following universal constants are mathematically derived from these three pure numbers taken to some exponential value; the fine structure constant, α^x*, the standard value of pi,* π^x*, and the square root of ten,* $(\sqrt{10})^x = B^x$*. The defined values of these numbers for this text are as follows;*

$$\alpha = 7.2948486174821110969893776806333 \times 10^{-3}$$

$$\pi = 3.14159265358979323846264338327950 \times 10^{0}$$

$$B = 3.16227766016837933199889354443270 \times 10^{0}$$

Also, for further reference the inverse fine structure constant, α^{-1}*, will be stipulated as*

$$\alpha^{-1} = 1.37083036597017123110448923472 7 \times 10^{2}.$$

The number's values of the fine structure constant and the inverse fine structure are selected as they are because of the following equation;

$$\alpha = \pi^{.02/\alpha} \mathrm{B}^{-7}$$

Or we could write it in this fashion;

$$\alpha = \pi^{.02\alpha^{-1}} \mathrm{B}^{-7}$$

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It can also be demonstrated in the following way why they were selected as they are. If we let $a^{-1}/100 = A = 1.37083036597017123110448923 4727$ *we can write the following equations;*

$$A^{(2/3)n}\pi^{(4/3)An} = 10^{n}$$

Or

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$$A^{\left(n/3\right)}\pi^{\left(2/3\right)An} = B^{n}$$

The following constants will be given to the nearest 10th significant digit with respect to the MKS system. To change the values to the cgs system simply change the B exponent; $B^{n}=10^{n/2}$ *or* $B^{2n}=10^{n}$.

Table 1

SUMMARY OF MATHEMATICALLY DERIVED VALUES OF THE FUNDAMENTAL PHYSICAL CONSTANTS

					CODATA Bulletin Values	
Quantity	**Symbol**	**MU**	**Value**	**Units**	**2014 values**	**% of change**
Speed of light in vacuum	c	$2\pi^{2}B^{16.5}\alpha^{.5}$	$2.998043173 \times 10^{8}$	ms^{-1}	2.99792458×10^{8}	.003955% up
Permeability of vacuum	μ_{o}	$4\pi B^{-14}$	$12.566370614 \times 10^{-6}$	NA^{-2}	$12.566370614 \times 10^{-6}$	0%
Permittivity of vacuum	ε_{o}	$\frac{1}{16\pi^{5}B^{19}\alpha}$	$8.853487337 \times 10^{-12}$	Fm^{-1}	$8.854187817 \times 10^{-1}$	-.0079% down
Newton constant of Gravitation	G	$\frac{1}{\pi^{2}B^{20.5}\alpha^{.5}}$	$6.671018003 \times 10^{-11}$	$m^{3}kg^{-1}s^{-2}$	6.67<u>384</u>…x 10^{-11}	-.04% down
Planck constant	h	$\frac{1}{\pi B^{67.5}\alpha^{.5}}$	$6.627381741 \times 10^{-34}$	Js	.6.62606<u>597</u> x 10^{-34}	-.0199% up

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Reduced Planck's constant	*h/2π*	$\frac{1}{2\pi^2 B^{67.5}\alpha^{.5}}$	1.054780564 x 10^{-34} Js	1.054572647 x 10^{-34}	.0197% up
Elementary charge	*e*	$\frac{1}{2\pi^2 B^{35}}$	1.602028581 x 10^{-19} C	1.602176565 x 10^{-19}	-.009% down
Magnetic flux quantum	Φ_o	$\frac{\pi}{B^{32.5}\alpha^{.5}}$	2.068434303 x 10^{-15} Wb	2.067833758 x 10^{-15}	.029% up
Electron mass	m_e	$4\pi^2 B^{-59}\alpha$	9.107014371 x 10^{-31} kg	9.109383 x 10^{-31}	-.0026% down
Proton mass	m_p	$24\pi^7 B^{-59}\alpha$	1.672155400 x 10^{-27} kg	1.672621777 x 10^{-27}	-.028% down
Proton-electron mass ratio	m_p/m_e	$6\pi^5$	1836.118109	1836.152673	-.0019% down
Fine-structure constant	α	$\pi^{.02/\alpha} B^{-7}$	7.294848617 x 10^{-3}	7.2973525369 x 10^{-3}	-.034% down
Inverse fine-structure constant	$\alpha^{\square}$	$\frac{B^7}{\pi^{.02/\alpha}}$	137.0830366	137.0359991	.034% up
Rydberg constant	P∞	$4\pi^5 B^{25}\alpha^4$	10961613.61 m^{-1}	10973731.56854	-.11043% down
Avogadro constant*	N_A, *L**	$R\left(48\pi B^{43.5}\alpha^{.5}\right)$	6.021729077 x 10^{23} mol^{-1}	6.02214129 x 10^{23}	-.0068%down
Faraday constant	*F*	$\frac{N_A}{2\pi^2 B^{35}}$	96469.82086 $Cmol^{-1}$	96485.3365	-.0016% down

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Molar gas constant*	R	$\frac{N_A}{48\pi B^{43.5}\alpha^{.5}}$	8.314228601	$Jmol^{-1}K^{-1}$	8.3144621	-.0028% down
Boltzmann constant	k	$\frac{1}{48\pi B^{43.5}\alpha^{.5}}$	$1.380704528 \times 10^{-23}$	JK^{-1}	$1.3806488 \times 10^{-23}$	.004% up
Stefan-Boltzmann constant	σ	$\frac{1}{1.5925248B^{16.5}\alpha^{1.5}}$	$5.667471833 \times 10^{-8}$	$Wm^{-2}K^{-4}$	5.670373×10^{-8}	-.05% down

**Avogadro's constant and the molar gas constant are based upon the assumption that the temperature in Kelvin, T, and the Pressure, p, are exact measures so that $Rp/Tk_{(exact)}$, where k is an exact Boltzmann constant, would equal $Rn_{o(exact)}$, where $n_{o(exact)}$ is an exact Loschmidt's constant;$2.686672057 \times 10^{25}\ m^{-3}$. By finding the ratio of the Loschmidt's constant, standard compared to the exact, produces the exact molar gas constant, $R_{(exact)}$, so that $Rn_{o(exact)}=R_{(exact)}n_o$, and therefore $Rn_{o(exact)}/n_o=R_{(exact)}$. Dividing the molar gas constant exact by the Boltzmann constant exact gives the Avogadro constant exact; $R_{(exact)}/k_{(exact)}= N_{A(exact)}$.*

The underlined portions of the values in the CODATA bulletin are the recommended change of variations in values in the Bulletin for 2014.

Table 2

OTHER MATHEMATICALLY DERIVED PHYSICAL CONSTANTS OF NOTICE:

General Constants

Quantity	Symbol	MU	Value	Units	CODATA Bulletin Values 2014 values	% of change
Planck mass	m_P	$\frac{\pi\alpha^{.25}}{B^{15.25}}$	$2.177228166 \times 10^{-8}$	kg	2.17651×10^{-8}	.033% up

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Planck length	l_P	$\frac{1}{4\pi^5 B^{68.75}\alpha^{1.25}}$	1.615921622 x 10^{-35}	m	1.61619997 x 10^{-35}	-.017% down
Planck time	t_P	$\frac{1}{8\pi^7 B^{85.25}\alpha^{1.75}}$	5.389921119 x 10^{-44}	s	5.39106 x 10^{-44}	-.02% down

Electromagnetic Constants

Bohr magneton	μ_B	$\frac{1}{32\pi^6 B^{43.5}\alpha^{1.5}}$	9.277401686 x 10^{-24}	JT^{-1}	9.274009682…x 10^{-24}	.0366% up
Nuclear magneton	μ_N	$\frac{1}{192\pi^{11} B^{43.5}\alpha^{1.5}}$	5.052725988 x 10^{-27}	JT^{-1}	5.0507835311 x 10^{-27}	.038% up

Atomic Constants

Bohr radius	a_o	$\frac{1}{16\pi^6 B^{25}\alpha^3}$	.5295804328 x 10^{-10}	m	.52917721092…x 10^{-10}	.076% up
Hartree energy	E_h	$16\pi^6 B^{-26}\alpha^4$	4.355964732 x 10^{-18}	J	4.359744342 x 10^{-18}	-.0867% down

Electron

Electron mass	m_e	$4\pi^2 B^{-59}\alpha$	9.107014371 x 10^{-31}	kg	9.109389140…x 10^{-31}	-.026% down

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Compton wavelength	λ_X	$\frac{1}{8\pi^5 B^{25}\alpha^2}$	$2.427325858 \times 10^{-12}$	m	$2.426310239 \times 10^{-12}$	.042% up
Classical electron radius	r_e	$\frac{1}{16\pi^6 B^{25}\alpha}$	$2.819152548 \times 10^{-15}$	m	$2.817940327 \times 10^{-15}$	.043% up
Electron specific charge	$-e/m_e$	$\frac{-1}{8\pi^4 B^{-24}\alpha}$	$-1.759115024 \times 10^{11}$	Ckg^{-1}	$-1.75882009 \times 10^{11}$	.016% up
Electron magnetic moment*	μ_ε	$\frac{1.001159652}{32\pi^6 B^{43.5}\alpha^{1.5}}$	$928.8160243 \times 10^{-26}$	JT^{-1}	$928.476430\ldots \times 10^{-25}$	.036% up

Muon

Muon mass	$m_{\square}$	$8\pi^2\left(\pi^4+6\right)B^{-59}\alpha$	$1.883496156 \times 10^{-28}$	kg	$1.883531475 \times 10^{-28}$	-.0019% down
Muon magnetic moment**	μ_μ	$\frac{1}{64\pi^6\left[\pi^4+6\right]B^{43.5}\alpha^{1.5}}$	$-4.485776634 \times 10^{-26}$	JT^{-1}	$4.490447807 \times 10^{-26}$	-.10% down
Muon-electron mass ratio	$m_{\square}/e$	$2\left(\pi^4+6\right)$	206.8181821		206.7682843…	.024% up

Tau***

Tau mass	m_t	$42.8\pi^3\left(\pi^4+6\right)B^{-59}\alpha$	$3.16569001 \times 10^{-27}$	kg	3.167426×10^{-27}	-0.056% down

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Tau-electron mass ratio	m_τ/m_e	$10.7\pi\left(\pi^4+6\right)$	3476.1009	3477.1531	-.030% down
Tau-muon mass ratio	$m_\tau/m_□$	5.35π	16.807520	16.816715	-.055% down
Tau-proton mass ratio	m_τ/m_p	$1.7833\pi^{-4}\left(\pi^4+6\right)$	1.893143957	1.8937217	-.030% down
Tau-neutron mass ratio	m_τ/m_n	$3.567\pi\left(\frac{\pi^4+6}{1+2\pi^5}\right)$	1.890267802	1.8911117	-.045% down

Proton

Proton mass	m_p	$6\pi^5\left(4\pi^2 B^{-59}\alpha\right)$	$1.672155400 \times 10^{-27}$	kg	$1.67262178 \times 10^{-27}$	-.028% down
Proton specific charge	e/m_p	$\frac{1}{48\pi^9 B^{-24}\alpha}$	9.580620200×10^7	kg	9.57883358×10^7	.0186% up
Proton Compton wavelength	$\lambda_{X\Pi}$	$\frac{1}{48\pi^{10}B^{25}\alpha}$	$1.321987865 \times 10^{-15}$	m	$1.32140986 \times 10^{-15}$	.0437%up
Proton magnetic moment*	μ_π	$\frac{2.792847387}{192\pi^{11}B^{43.5}\alpha^{1.5}}$	$1.411149257 \times 10^{-26}$	JT^{-1}	$1.41060674 \times 10^{-26}$	.038% up

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Neutron

Neutron mass	m_n	$12\pi^2\left(1+2\pi^5\right)B^{-59}\alpha$	1.674887505 x 10^{-27} kg	1.67492735 x 10^{-27}	-.002% down
Neutron-electron mass ratio	m_n/m_e	$2.5+6\pi^5$	1838.618109	1838.683661	-.0036 down
Neutron-proton mass ratio	m_n/m_p	$.5\pi^{-5}+1$	1.001633882	1.0013784192	.0255 up

Deuteron

Deuteron mass	m_d	$48\pi^7B^{-59}\alpha$	3.344310800 x 10^{-27} kg	3.34358348 x 10^{-27}	.0217 up
Deuteron-electron mass ratio	m_d/m_e	$12\pi^5$	3672.236217	3670.48297	.0478 up
Deuteron-proton mass ratio	m_d/m_p	$\frac{48\pi^7B^{-59}\alpha}{24\pi^7B^{-59}\alpha}$	2	1.9990075	.005% up

*** These ratios of the magnetic moments are based upon the assumption that the ratios would be the same value, such as ¾ is to 9/12, as is 12/16, as is 75/100, whether the MU standard is used or the CODATA values are used.*

****The Tau mass and ratios were added only after the 2014 bulletin was published.*

Table 3

PHYSICO-CHEMICAL CONSTANTS****

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Avogadro constant	N_A, L	$R\left[48\pi B^{43.5}\alpha^{.5}\right]$	6.021729077 x 10^{23}	mol^{-1}	6.0221413 x 10^{23}	-.0068 down
Atomic mass constant,	$\frac{1}{12}m\left(^{12}C\right)$ m_u	$\frac{1}{R\left(48\pi B^{49.5}\alpha^{.5}\right)}$	1.660652593 x 10^{-27}	kg	1.6605389 x 10^{-27}	.0068 up
In electron volts	$m_u c^2/\{e\}$	$\frac{\pi^5 B^{6.5}\alpha^{.5}}{6R}$	931.7175876	MeV	931.4941	.024% up
Faraday constant	F	$\frac{24RB^{8.5}\alpha^{.5}}{\pi}$	96469.82086	$Cmol^{-1}$	96485.337	-.016% down
Molar Planck constant	$N_A h$	$48RB^{-24}$	3.990829734 x 10^{-10}	$Jsmol^{-1}$	3.9903127 x 10^{-10}	.013% up
Molar gas constant	R	$\frac{N_A}{48\pi B^{43.5}\alpha^{.5}}$	8.314228601	$Jmol^{-1}K^{-1}$	83144622	-.002% down
Boltzmann constant,	$R/N_A, k$	$\frac{1}{48\pi B^{43.5}\alpha^{.5}}$	1.380704528 x 10^{-23}	JK^{-1}	1.3806588 x 10^{-23}	.0033% up
Molar volume (ideal gas)	RT/p,V_m	$R\frac{273.15}{101.325}$	22.41333869	L/mol	22.413968	.0028% down
Loschmidt constant,	$N_A/V_m, n_o$	$17.80560132\pi B^{49.5}\alpha^{.5}$	2.686672057 x 10^{25}	m^{-3}	2.6867805 x 10^{25}	-.004% down
p(1000)/Tk	n_o	“……’’……….”	“………’’…….”		“……“……”…..”	
Stefan-Boltzmann constant	σ	$\frac{1}{159.25248B^{16.5}\alpha^{1.5}}$	5.667471833 x 10^{-8}	$Wm^{-2}K^{-4}$	5.670373 x 10^{-8}	-.05% down

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*****The Physico-Chemical constants are based upon the assumption that the temperature, T, and pressure, p, are exact measures in chemistry. If these values change then the values of the constants will change accordingly.*

Table 4

ENERGY CONVERSION FACTORS:

	J	**kg**	**m^{-1}**	**Hz**
1**J**	1	$\frac{1}{4\pi^4\alpha B^{33}} = 1/\{c^2\}$	$\frac{B^{51}}{2\pi} = 1/\{hc\}$	$\pi\alpha^{.5}B^{67.5} = 1/\{h\}$
MU value	1	1.112562032 x 10^{-17}	5.032921197 x 10^{24}	1.508891504 x 10^{33}
CODATA				
Value **'14**	1	1.11265006 x 10^{-17}	5.034117008 x 10^{24}	1.5091903117 x10^{33}
% of change	0%	-.0079% down	-.0239% down	-.0198% down
1**kg**	$4\pi^4\alpha B^{33} = \{c^2\}$	1	$2\pi^3\alpha B^{84} = \{c/h\}$	$4\pi^5\alpha^{1.5}B^{100.5} = \{c^2/h\}$
MU value	8.988262868 x 10^{16}	1	4.523721871 x 10^{41}	1.356231347 x 10^{50}
CODATA				
Value '**14**	8.987679019 x 10^{16}	1	4.525274636 x 10^{41}	1.356929696 x10^{50}

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% of change	.0079% up	0%	-.034% down	-.051% down
1 **m^{-1}**	$2\pi B^{-51} = \{hc\}$	$\frac{1}{2\pi^3\alpha B^{84}} = \{h/c\}$	1	$2\pi^2\alpha^{.5}B^{16.5} = \{c\}$
MU value	1.986917659 x 10^{-25}	2.210569147 x 10^{-42}	1	299804317.3
CODATA				
Value '**14**	1.986445683 x 10^{-25}	2.21021890 x 10^{-42}	1	299792458
% of change	.024% up	.0158% up	0%	.004% up
1 **Hz**	$\frac{1}{\pi\alpha^{.5}B^{67.5}} = \{h\}$	$\frac{1}{4\pi^5\alpha^{1.5}B^{100.5}} = \{h/c^2\}$	$\frac{1}{2\pi^2\alpha^{.5}B^{16.5}} = 1/\{c\}$	1
MU value	6.627381741 x 10^{-34}	7.373373296 x 10^{-51}	3.335509004 x 10^{-9}	1
CODATA				
Value '**14**	6.62606957 x 10^{-34}	7.372496678 x 10^{-51}	3.335640952 x 10^{-9}	1
% of change	.0198% up	.01189% up	-.00396% down	0%
1 **K**	$\frac{1}{48\pi\alpha^{.5}B^{43.5}} = \{k\}$	$\frac{1}{192\pi^5\alpha^{1.5}B^{76.5}} = \{k/c^2\}$	$\frac{B^{7.5}}{96\pi^2\alpha^{.5}} = \{k/hc\}$	$\frac{B^{24}}{48} = \{k/h\}$
MU value	1.380704528 x 10^{-23}	1.536119435 x 10^{-40}	69.48977084	2.083333333 x 10^{10}

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CODATA				
Value ‘**14**	$1.3806488 \times 10^{-23}$	$1.53617896 \times 10^{-40}$	69.50347921	$2.08366179 \times 10^{10}$
% of change	.004% up	-.0039 down	-.023% down	-.0158% down
1**eV**	$\frac{1}{2\pi^2 B^{35}} = \{e\}$	$\frac{1}{8\pi^6 \alpha B^{68}} = \{e/c^2\}$	$\frac{B^{16}}{4\pi^3} = \{e/hc\}$	$\frac{\alpha^{.5} B^{32.5}}{2\pi} = \{e/h\}$
MU value	$1.602028581 \times 10^{-19}$	$1.782356173 \times 10^{-36}$	806288.3601	$2.417287314 \times 10^{14}$
CODATA				
Value ’**14**	$1.602176565 \times 10^{-19}$	$1.782661845 \times 10^{-36}$	806554.4296	$2.41798935 \times 10^{14}$
% of change	-.009% down	-.017% down	-.033% down	-.029% down
1 **u**	$\frac{\pi^3 \alpha^{.5}}{12 R B^{16.5}} = \{m_u c^2\}$	$\frac{1}{R\left(48\pi\alpha^{.5} B^{49.5}\right)} = \{m_u\}$	$\frac{\pi^2 \alpha^{.5} B^{34.5}}{24R} = \{m_u c/h\}$	$\frac{\pi^4 \alpha B^{51}}{12R} = \{m_u c^2/h\}$
MU value	$1.492638203 \times 10^{-10}$	$1.660652593 \times 10^{-27}$	$7.512330453 \times 10^{14}$	$2.252229103 \times 10^{23}$
CODATA				
Value ‘**14**	$1.4924179556 \times 10^{-10}$	$1.660538922 \times 10^{-27}$	7.5130066×10^{14}	$2.25234272 \times 10^{23}$
% of change	.015% up	.0068% up	-.009% down	-.005% down

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1 **hartree**	$16\pi^6\alpha^4\mathrm{B}^{-26} = \{2R_\square hc\}$	$4\pi^2\alpha^3\mathrm{B}^{-59} = \{2R_\square h/c\square$	$8\pi^5\alpha^4\mathrm{B}^{25} = \{2R_\square\square$	$16\pi^7\alpha^{4.5}\mathrm{B}^{41.5} = \{2R_\square c\square$
MU value	$4.355964732 \times 10^{-18}$	$4.846280973 \times 10^{-35}$	21923227.23	$6.572678173 \times 10^{15}$
CODATA				
Value '**14**	$4.35974434 \times 10^{-18}$	$4.850870065 \times 10^{-35}$	21947463.12	$6.579683916 \times 10^{15}$
% of change	-.0867% down	-.0946% down	-.11% down	-.106% down

	K	**eV**	**u**	**hartree**
1**J**	$48\pi\alpha^{.5}\mathrm{B}^{43.5} = 1/\{k\}$	$2\pi^2\mathrm{B}^{35} = 1/\{e\}$	$12R\pi^{-3}\alpha^{-.5}\mathrm{B}^{16.5} = 1/\{m_\mathrm{u}c^2\}$	$\frac{\mathrm{B}^{26}}{16\pi^6\alpha^4} = 1/\{2R_\square hc\}$
Mu value	$7.242679226 \times 10^{22}$	$6.242085891 \times 10^{18}$	$6.699547135 \times 10^{9}$	$2.295702701 \times 10^{17}$
CODATA				
Value '**14**	$7.242971565 \times 10^{22}$	$6.241513239 \times 10^{18}$	$.700535844 \times 10^{9}$	$2.293712481 \times 10^{17}$
% of change	-.0040% down	.0092% up	-.0099% down	.087% up
1 **kg**	$192\pi^5\alpha^{1.5}\mathrm{B}^{76.5} = \{c^2/k\}$	$8\pi^6\alpha\mathrm{B}^{68} = \{c^2/e\}$	$R\left(48\pi\alpha^{.5}\mathrm{B}^{49.5}\right) = 1/\{m_\mathrm{u}\}$	$\frac{\mathrm{B}^{59}}{4\pi^2\alpha^3} = \{c/2R_\square h\}$
MU value	$6.509910476 \times 10^{39}$	$5.610550883 \times 10^{35}$	$6.021729075 \times 10^{26}$	$2.063437934 \times 10^{34}$

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CODATA				
Value **'14**	6.509658204 x 10^{39}	5.609588845 x 10^{35}	6.022141290 x 10^{26}	2.0614859 x 10^{34}
% of change	.0039% up	.017% up	-.0068% down	.095% up
1 $\mathbf{m^{-1}}$	$96\pi^2\alpha^{.5}B^{-7.5} = \{hc/k\}$	$4\pi^3B^{-16} = \{hc/e\}$	$\frac{24R}{\pi^2\alpha^{.5}B^{34.5}} = \{h/m_u c\}$	$\frac{1}{8\pi^5\alpha^4B^{25}}$ =1/{2 R□□
MU value	.01439060725	1.240251068 x 10^{-6}	1.331144851 x 10^{-15}	4.561372235 x 10^{-8}
CODATA				
Value '**14**	.01438776960	1.239841929 x 10^{-6}	1.331025050 x 10^{-15}	4.556335256…x10^{-8}
% of change	.0097% up	.003% up	.009% up	.11% up
1 **Hz**	$48B^{-24} = \{h/k\}$	$\frac{2\pi}{\alpha^{.5}B^{32.5}} = \{h/e\}$	$\frac{12R}{\pi^4\alpha B^{51}} = \{h/m_u c^2\}$	$\frac{B^{-41.5}}{16\pi^7\alpha^{4.5}}$ =1/{2cR□□
MU value	4.8000000000 x 10^{-11}	4.136868606 x 10^{-15}	4.440045636 x 10^{-24}	1.521449816 x 10^{-16}
CODATA				
Value '**14**	4.799243348 x 10^{-11}	4.135667513 x 10^{-15}	4.439821666 x 10^{-24}	1.519829847 x10^{-16}
% of change	0158% up	.029% up	.005% up	.00107% up

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1**K**	1	$\frac{\pi}{24\alpha^{.5}\mathrm{B}^{8.5}} = \{k/e\}$	$\frac{R}{4\pi^4\alpha\mathrm{B}^{27}} = \{k/m_u c^2\}$	$\frac{\mathrm{B}^{-17.5}}{768\pi^7\alpha^{4.5}} = \left\{\frac{k}{2R_\infty hc}\right\}$
MU value	1	8.618476252 x 10^{-5}	9.250095063 x 10^{-14}	3.169687113 x 10^{-6}
CODATA				
Value '**14**	1	8.617332385 x 10^{-5}	9.251086772 x 10^{-14}	3.166811384 x 10^{-6}
% of change	0%	.0133% up	-.0107% down	.091% up
1 **eV**	$\frac{24\alpha^{.5}\mathrm{B}^{8.5}}{\pi} = \{e/k\}$	1	$\frac{6R}{\pi^5\alpha^{.5}\mathrm{B}^{18.5}} = \{e/m_u c^2\}$	$\frac{1}{32\pi^8\alpha^4\mathrm{B}^9} = \left\{\frac{e}{2R_\infty hc}\right\}$
MU value	11602.97912	1	1.073286599 x 10^{-9}	.03677781340
CODATA				
Value '**14**	11604.51930	1	1.073544150 x 10^{-9}	.03674932384
% of change	-.0133% down	0%	-.024% down	.078% up
1 *u*	$\frac{4\pi^4\alpha\mathrm{B}^{27}}{R} = \{m_u c^2/k\}$	$\frac{\pi^5\alpha^{.5}\mathrm{B}^{18.5}}{6R} = \{m_u c^2/e\}$	1	$\frac{\mathrm{B}^{9.5}}{192R\pi^3\alpha^{3.5}} = \left\{\frac{m_u c}{2R_\infty h}\right\}$
MU value	1.081069971 x 10^{13}	931.7175868 x 10^6	1	3.426653555 x 10^7
CODATA				

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Value ‘**14**	$1.080954081 \times 10^{13}$	$931.4940609 \times 10^{6}$	1	$3.423177689 \times 10^{7}$
% of change	.0107% up	.024% up	0%	.10% up
1 **hartree**	$768\pi^7\alpha^{4.5}B^{17.5} = \left\{\frac{2R_\infty hc}{k}\right\}$	$32\pi^8\alpha^4 B^9 = \left\{\frac{2R_\infty hc}{e}\right\}$	$\frac{192R\pi^3\alpha^{3.5}}{B^{9.5}} = \left\{\frac{2R_\infty h}{m_u c}\right\}$	1
MU value	$3.154885527 \times 10^{5}$	27.19030599	$2.918299104 \times 10^{-8}$	1
Value ‘**14**	$3.157750427 \times 10^{5}$	27.21138502	$2.921262320 \times 10^{-8}$	1
% of change	-.091% down	-.077% down	-.101% down	0%

In the instance of the constants of nature, size matters. The square root of ten, ($\sqrt{10}$), is a significant and integral part of the constants. With the square root of ten, one can simply change from the square root of ten to one thousand to one hundred thousand by moving the decimal one place each time and squaring;

$$3.162277660 = \sqrt{10}; \quad 31.62277660 = \sqrt{1000}; \quad 316.2277660 = \sqrt{10000}$$

The square root of ten ($\sqrt{10}$) is a choice for several reasons. First, it is a standard in the electrostatic equations as the proportionality constant of the magnetic force equation: $4\pi \times 10^{-7}$, and the permeability of space which is written just as easily as $4\pi\ (3.162277660^{-14})$. It works with the equations much better for reasons as we have seen in the above tables. Logarithmically it also works

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well. In the base ten formula, (log x = log c+ k), it requires only a slight variation to change to this form, (log x = log c + .5k). Also, the square root of ten can be inverted by a simple change of the sign of the exponent from plus (+) to minus (-), and most importantly ten is used as a base for scientific notation, but finally, it can be derived from the other two numbers, pi (π), and the fine structure constant (α) as 7.294848617… x 10^{-3}. This becomes extremely important when converting from Newtons to dynes, a Newton being one hundred thousand times greater than a dyne or Joules to dyne centimeters. It is obvious the square root of one Newton, 1, is not the equivalent to taking the square root of 10^5 dynes which is 316.227766 or the square root of one Joule, 1, to the square root of 10^7 dyne centimeters or ergs which is 3,162.277660. It was this conversion factor when changing from the MKS to the cgs systems, giving different answers for what appeared should be the same when converting from one to the other that helped lead to this discovery. Interestingly, Planck's constant, *h*, times the velocity of light, *c*, divided by two, 2, divided by pi, π, *{hc/2π},* in the CODATA Bulletin is equal to 3.161529326 x 10^{-17} in dynes and …x 10^{-26} in Newtons; this number appears close to the square root of ten times ten to the negative seventeenth in dynes. When one squares this number, one gets 9.995267507 x 10^{-34} in dynes and …x10^{-52} in Newtons. With the Mathematical Units, one gets exactly 1 x 10^{-33} in dynes and 1 x 10^{-51} in Newtons. This is a .02367% of one percent increase from the accepted value.

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There is one other constant that should be mentioned and that is the electrostatic constant of **k**, which is equal to 8.988262874×10^9, (it is bolded and not italicized to distinguished it from the Boltzmann constant k) and is derived in this fashion

$$\mathbf{k} = 1/4\pi\varepsilon_o = 16\pi^5\alpha B^{19}/4\pi = 4\pi^4\alpha B^{19} = 8.988262874 \times 10^9,$$

And we find the following;

$$\mathbf{k}e^2 = \alpha B^{-51} = 2.306833689 \times 10^{-28}$$

or

$$\mathbf{k}e^2 = \pi^{2A}B^{-58} = 2.306833689 \times 10^{-28}.$$

Where A is equal to 1.370830366, e is the elementary charge value of $1.602028581 \times 10^{-19}$, B is the square root of ten and π is its normal determination of 3.14…, α is the fine structure constant and ε_o is the permittivity of the vacuum value at $1/16\pi^5\alpha B^{19}$, –so that further we find;

$$\alpha B^{-51} = \pi^{2A}B^{-58} = 2.306833689 \times 10^{-28}$$

(*This number is significant. It is part and parcel of every constant that has mass.)*

And further to;

$$\alpha = \pi^{2A}B^{-7} = 7.294848617 \times 10^{-3},$$

But also,

$$\alpha B^7 = \pi^{2A} = 2.306833689 \times 10^1.$$

This may give us insight to the characteristics and patterns that exist among the universal constants. The following questions arise:

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1) Why the square root of ten to the -59 times alpha ($B^{-59}\alpha$) is part of every constant that contains mass? ($2.306833689 \times 10^{-31}$)

2) Why is the proton-electron mass ratio almost exactly six times pi to the fifth ($6\pi^5$) = 1836.118109, and the neutron-electron mass ratio is almost exactly two point five plus six times pi to the fifth, ($2.5+6\pi^5$) =1838.618109?

3) Why the electron mass is almost exactly $[4\pi^2]B^{-59}\alpha = 9.107014371 \times 10^{-31}$?

4) Why does every equation involving the muon and tau particles have pi to the fourth plus six (π^4+6) = 103.4090910?

5) Why is the tau-muon mass ratio almost exactly five-point thirty-five times pi (5.35π) = 16.807520?

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These are just a few of the many questions. Why do these numbers and patterns reoccur over and over in the universal constants unless they are all interrelated somehow? These are the things that need to be investigated and answered.

In concluding, it has been shown that the fundamental universal physical constants can be derived from just three commonly used non-dimensional numbers taken to some exponential value. In most cases, they are the same as the ones used when rounded off to the nearest significant digit and even the accepted CODATA and NIST values can be derived by a small percentage change of less than one percent of all the constants or by using fractional exponents of π or α.

Even though these values are not the standard accepted values of the experimentally derived values, they are all within less than one tenth of one percent of the accepted values, and in any event, perhaps these mathematically derived units (MU) of the constants will lead to more significant discoveries of other constants which have yet to be uncovered in nature.

CODATA Bulletin, Pergamon Press, 2014

NIST, Internet recommended values 2014