An Investigation into the Fundamental Units of Nature and the Planck System of Fundamental Units					
First Universal Physical Constant				**Exact are in Bold**	
1) speed light	c	velocity $^{metres}/_{second}$	L T $^{-1}$	**2.9979245800E+08**	m/s
Fixing the speed of light as a fixed number of metres is the first step in creating a more coherent system of SI units					
Properies of Free Space	*4π represents the solid angle around a point*				
permeability of free space	μ_0		M L Q $^{-2}$	1.2566370612E-06	$^{henrys}/_{meter}$
$^{flux\ density}/_{field\ strength}$	B= μH	$4\pi \times 10^{-7}$		1.2566370614E-06	$^{henrys}/_{meter}$
permittivity of free space	ε_0	$\varepsilon_0 = 1 / \mu_0 c^2$	M $^{-1}$ L $^{-3}$ T ^{2} Q ^{2}	8.8541878192E-12	$^{farads}/_{meter}$
$^{charge\ density}/_{field\ strength}$		from $4\pi \times 10^{-7}$		8.8541878176E-12	$^{farads}/_{meter}$
The permeability of free space is no longer exactly $4\pi\times10^{-7}$ because c has been "rounded" to a fixed 9 place figure					
Other Fundamental Constants in SI Units					
2) gravitational constant	G	Force = G m_1m_2/r^2	M $^{-1}$ L ^{3} T $^{-2}$	6.6743000000E-11	$^{Newton\text{-}metre^2}/_{kg^2}$
Planck constant	h	E = h c / λ	M L ^{2} T $^{-1}$	6.6260701500E-34	joule-sec
3) reduced Planck constant	ħ	unit of action	M L ^{2} T $^{-1}$	**1.0545718176E-34**	joule-sec
4) Boltzmann constant	k_B	p V = N_A k_B T	M L ^{2} T $^{-2}$ Θ $^{-1}$	**1.3806490000E-23**	$^{joules}/_{degree\ Kelvin}$
5) Coulomb constant	k_e	F = k_e q_1 q_2 / r^2	M L ^{3} T $^{-2}$ Q $^{-2}$	8.9875517923E+09	$^{newton\text{-}metre^2}/_{coulomb^2}$
Including the Coulomb constant extends the system into electromagnetism by introducing ε_0 and hence k_e					
For completeness there are two other fundamental constants of nature now given exact values					
6) Avogadro's constant	N_A	The number of particles in one mole		**6.0221407600E+23**	dimensionless
7) Elementary charge	e	e^2 = 2 h α / μ_0 c		**1.6021766340E-19**	coulomb
This relationship therefore fixes the fine structure constant α					
Fine structure constant	α^{-1}	α^{-1} = 2h / μ_o c e^2	*fixed by* μ_0	1.3703599918E+02	dimensionless
Planck Fundamental Constants					
Planck Mass	m_P	≅ 32 μgrams	√(ħ c / G)	2.1764343427E-08	kilograms
Planck Length	ℓ_P	quantum limit	√(ħ G / c^3)	1.6162550244E-35	metres
Planck Time	t_P	quantum limit	√(ħ G / c^5)	5.3912464483E-44	seconds
Speed Light (Planck speed)	c	maximum limit	ℓ_P / t_P	2.9979245800E+08	metres/second
Planck Temperature	$\mathcal{T}_P$	quantum limit	√(ħ c^5 / G k_B^2)	1.4167841622E+32	kelvin
Plank Charge	q_P		√(ħ c / k_e)	1.8755460378E-18	coloumb
Because μ_0 is no longer exactly $4\pi\times10^{-7}$ traditional rearrangments give slightly different values. That's the price of fixing c.					
Recalculating Fundamental Constants from Dimensions in Planck units - recreates original values					
gravitational constant	G	F = G m_1 m_2 / r^2	M $^{-1}$ L ^{3} T $^{-2}$	6.6743000000E-11	$^{newton\text{-}metre^2}/_{kg^2}$
gravitational constant	G	$\ell_P^3 c^2$ / h t_P	M $^{-1}$ L ^{3} T $^{-2}$	6.6743000000E-11	$^{newton\text{-}metre^2}/_{kg^2}$
reduced Planck constant	ħ		M L ^{2} T $^{-1}$	1.0545718176E-34	joule-sec
Boltzmann constant	k_B	ke = k_B × T	M L ^{2} T $^{-2}$ $\mathcal{T}^{-1}$	1.3806490000E-23	joules / degree
Coulomb constant	k_e	1 / 4 π ε_0	M L ^{3} T $^{-2}$ Q $^{-2}$	8.9875517923E+09	$^{newton\text{-}metre^2}/_{coulomb^2}$
Planck Derived Constants			**Calculated**	**Derived from Fundamental**	
Plank Area	ℓ_P^2	ħ G / c^3	2.6122803040E-70	2.6122803040E-70	$metres^2$
Plank Volume	ℓ_P^3	√($ħ^3$ G^3 / c^9)	4.2221111665E-105	4.2221111665E-105	$metres^3$
Plank Momentum	m_Pc	√($ħ^3$ c^3 / G)	6.5247860128E+00	6.5247860128E+00	kg-metre/sec
Plank Acceleration a_p	c / t_P	√(c^7 / ħ G)	5.5607262787E+51	5.5607262787E+51	$metres/sec^2$
Plank Force $\mathcal{F}_P$	m_P × a_P	c^4 / G	1.2102555643E+44	1.2102555643E+44	newtons
Plank Energy $\mathcal{E}_P$	$\mathcal{F}_P$ × ℓ_P	√(ħ c^5 / G)	1.9560816367E+09	1.9560816367E+09	joules
Plank Density - ρ_p	m_P / ℓ_P^3	c^5 / ħ G	3.5176729424E-36	5.1548485032E+96	kg / $metre^3$
Plank Frequency f_p	1 / t_P	√(c^5 / ħ G)	1.8548586298E+43	1.8548586298E+43	per second
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Re-deriving Planck Units			**Calculated**	**Given**	***Error***
Planck Mass m_P	ℓ_P	$\hbar$ / $\ell_P c$	2.1764343427E-08	2.1764343427E-08	
Planck Mass m_P	t_P	$\hbar$ / $t_P c^2$	2.1764343427E-08	2.1764343427E-08	*0.000E+00*
Planck Mass m_P	$\mathcal{T}_P$	$\mathcal{T}_P k_B$ / c^2	2.1764343427E-08	2.1764343427E-08	*-3.040E-16*
Planck Mass m_P	q_P	$q_P \times \sqrt{(k_e/G)}$	2.1764343427E-08	2.1764343427E-08	*0.000E+00*
Planck Length ℓ_P	m_P	$\hbar$ / $m_P c$	1.6162550244E-35	1.6162550244E-35	*0.000E+00*
Planck Length ℓ_P	t_P	$c\ t_P$	1.6162550244E-35	1.6162550244E-35	*1.654E-16*
Planck Length ℓ_P	$\mathcal{T}_P$	$\hbar c$ / $\mathcal{T}_P k_B$	1.6162550244E-35	1.6162550244E-35	*0.000E+00*
Planck Length ℓ_P	q_P	$\hbar$ / $q_P c \times \sqrt{(G/k_e)}$	1.6162550244E-35	1.6162550244E-35	*0.000E+00*
Planck Time t_P	m_P	$\hbar$ / $m_P c^2$	5.3912464483E-44	5.3912464483E-44	*-1.847E-16*
Planck Time t_P	ℓ_P	ℓ_P / c	5.3912464483E-44	5.3912464483E-44	*-1.847E-16*
Planck Time t_P	$\mathcal{T}_P$	$\hbar$ / $\mathcal{T}_P k_B$	5.3912464483E-44	5.3912464483E-44	*0.000E+00*
Planck Time t_P	q_P	$\hbar$ / $q_P c^2 \times \sqrt{(G/k_e)}$	5.3912464483E-44	5.3912464483E-44	*-3.694E-16*
Planck Temperature $\mathcal{T}_P$	ℓ_P	$\hbar c$ / $\ell_P k_B$	1.4167841622E+32	1.4167841622E+32	*1.271E-16*
Planck Temperature $\mathcal{T}_P$	m_P	$m_P c^2$ / k_B	1.4167841622E+32	1.4167841622E+32	*0.000E+00*
Planck Temperature $\mathcal{T}_P$	t_P	$\hbar$ / $t_P k_B$	1.4167841622E+32	1.4167841622E+32	*0.000E+00*
Planck Temperature $\mathcal{T}_P$	q_P	$q_P c^2$ / $k_B \times \sqrt{(k_e/G)}$	1.4167841622E+32	1.4167841622E+32	*1.271E-16*
Planck Charge q_P	m_P	$m_P \times \sqrt{(G/k_e)}$	1.8755460378E-18	1.8755460378E-18	*0.000E+00*
Planck Charge q_P	ℓ_P	$\hbar$ / $\ell_P c \times \sqrt{(G/k_e)}$	1.8755460378E-18	1.8755460378E-18	*-2.054E-16*
Planck Charge q_P	t_P	$\hbar$ / $t_P c^2 \times \sqrt{(G/k_e)}$	1.8755460378E-18	1.8755460378E-18	*0.000E+00*
Planck Charge q_P	$\mathcal{T}_P$	$\mathcal{T}_P k_B / c^2 \times \sqrt{(G/k_e)}$	1.8755460378E-18	1.8755460378E-18	*-4.107E-16*
Planck Charge q_P	q_P	$\sqrt{(4 \pi \varepsilon_0 h c)}$	1.8755460385E-18	1.8755460378E-18	*3.635E-10*
Planck Charge q_P	q_P	$\sqrt{(4 \pi \hbar / \mu_0 c)}$	1.8755460385E-18	1.8755460378E-18	*3.635E-10*
Planck Charge q_P	q_P	$e / \sqrt{\alpha}$	1.8755460385E-18	1.8755460378E-18	*3.635E-10*
Planck Force $\mathcal{F}_P$	m_P / ℓ_P	$G m_P^2 / \ell_P^2$	1.2102555643E+44	1.2102555643E+44	*1.637E-16*
Planck Force $\mathcal{F}_P$	m_P / t_P	$m_P c / t_P$	1.2102555643E+44	1.2102555643E+44	*0.000E+00*
Planck Force $\mathcal{F}_P$	$\ell_P t_P$	$G\hbar^2 / \ell_P^2 t_P^2 c^4$	1.2102555643E+44		
Planck Force $\mathcal{F}_P$	$\ell_P t_P$	$\hbar / \ell_P t_P$	1.2102555643E+44	1.2102555643E+44	*0.000E+00*
Planck Force $\mathcal{F}_P$	ℓ_P	$G\hbar^2 / \ell_P^4 c^2$	1.2102555643E+44		
Planck Force $\mathcal{F}_P$	$\mathcal{F}_P$	$(4\pi\varepsilon_0)^{-1} \times (q_P / t_P)^2$	1.2102555635E+44	1.2102555643E+44	*-7.269E-10*
Planck Force $\mathcal{F}_P$	$\mathcal{F}_P$	$\mathcal{E}_P / \ell_P$	1.2102555643E+44	1.2102555643E+44	*0.000E+00*
Planck Energy $\mathcal{E}_P$	$\mathcal{E}_P$	$\hbar$ / t_P	1.9560816367E+09	1.9560816367E+09	*0.000E+00*
Planck Energy $\mathcal{E}_P$	$\mathcal{E}_P$	$m_P \ell_P^2 / t_P^2$	1.9560816367E+09	1.9560816367E+09	*-1.219E-16*
Planck Energy $\mathcal{E}_P$	$\mathcal{E}_P$	$k_B T_P$	1.9560816367E+09	1.9560816367E+09	*-2.438E-16*
Planck Energy $\mathcal{E}_P$	$\mathcal{E}_P$	$\mathcal{F}_P \ell_P$	1.9560816367E+09	1.9560816367E+09	*0.000E+00*
Planck Energy $\mathcal{E}_P$	$\mathcal{E}_P$	$m_P c^2$	1.9560816367E+09	1.9560816367E+09	*0.000E+00*
Planck Density	ρ_P	$\hbar t_P / \ell_P^5$	5.1548485032E+96	5.1548485032E+96	*3.680E-16*
Interpretation of Planck Units					
Planck Mass	m_P	*upper limit on the mass elementary particle / lower limit on the mass of a black hole*			
Planck Length	ℓ_P	*gravitational limit of quantum theory / quantum limit of general relativity*			
Planck Time	t_P	*gravitational limit of quantum theory*			
Planck Temperature	$\mathcal{T}_P$	*upper limit of temperature (absolute hotness)*			
Planck Density	ρ_P	*limiting density of matter*			
Volume universe when compressed		1.93992E-37	Volume hydrogen atom		6.2E-31
so you could fit 3 million universes inside a hydrogen atom which is pretty amazing by any standards.					☺ *rg*
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