Alcune costanti fondamentali espresse in unità opportune

$$c = \text{velocità della luce} = 2.998 \times 10^{8}\ \text{m/s}$$

$$e = \text{carica dell'elettrone} = 1.602 \times 10^{-19}\ \text{C}$$

$$h = \text{costante di Planck} = 6.626 \times 10^{-34}\ \text{J}\cdot\text{s} = 4.136 \times 10^{-15}\ \text{eV}\cdot\text{s}$$

$$\hbar = \frac{h}{2\pi} = 1.055 \times 10^{-34}\ \text{J}\cdot\text{s} = 0.658 \times 10^{-15}\ \text{eV}\cdot\text{s}$$

$$k = \frac{1}{4\pi\epsilon_0} = \text{costante di Coulomb} = 8.988 \times 10^{9}\ \text{N}\cdot\text{m}^2/\text{C}^2$$

$$k = \frac{R}{N} = \text{costante di Boltzmann} = 1.38 \times 10^{-23}\ \text{J/K} = 8.617 \times 10^{-5}\ \text{eV/K}$$

Alcune utili conversioni e combinazioni

$$1\ \text{eV} = 1.602 \times 10^{-19}\ \text{J}$$

$$1\ \text{Å} = 10^{-10}\ \text{m} = 10^{5}\ \text{fm}$$

$$hc = 19.865 \times 10^{-26}\ \text{J}\cdot\text{m} = 12.41 \times 10^{3}\ \text{eV}\cdot\text{Å} = 1241\ \text{MeV}\cdot\text{fm}$$

$$\hbar c = 3.165 \times 10^{-26}\ \text{J}\cdot\text{m} = 1973\ \text{eV}\cdot\text{Å} = 197.3\ \text{MeV}\cdot\text{fm}$$

$$ke^2 = 1.44\ \text{MeV}\cdot\text{fm}$$

$$\frac{ke^2}{\hbar c} = \text{costante di struttura fine} = \frac{1}{137}$$

$$\frac{e\hbar}{2m_e} = \text{magnetone di Bohr} = 9.27 \times 10^{-24}\ \text{J/T} = 5.79 \times 10^{-5}\ \text{eV/T}$$

Masse di alcune particelle elementari

particella	massa a riposo, m_0 (kg)	m_0c^2 (MeV)
elettrone	9.109×10^{-31}	0.511
protone	1.673×10^{-27}	938.3
neutrone	1.675×10^{-27}	939.6
unità di massa atomica (1 u)	1.661×10^{-27}	931.5

		CGS unit	SI unit
distance	s	centimeter	meter
mass	m	gram	kilogram
time	t	second	second
velocity	v	cm sec^{-1}	m sec^{-1}
momentum	p	gm cm sec^{-1}	kg m sec^{-1}
force	F	dyne (gm cm sec^{-2})	newton (kg m sec^{-2})
energy, work	W	erg (dyne cm)	joule (newton m)
power	P	erg sec^{-1}	watt (joule sec^{-1})
electric charge	q	esu	coulomb (amp sec)
charge density	ρ	esu cm^{-3}	coulomb m^{-3}
electric potential	φ	statvolt (erg esu^{-1})	volt (joule $coulomb^{-1}$)
electric field	E	statvolt cm^{-1} (dyne esu^{-1})	volt m^{-1} (newton $coulomb^{-1}$)
electric current	I	esu sec^{-1}	ampere (coulomb sec^{-1})
current density	J	esu sec^{-1} cm^{-2}	amp m^{-2}
resistance	R	cm^{-1} sec	ohm (volt amp^{-1})
resistivity	ρ	sec	ohm m
magnetic field	B	gauss (dyne esu^{-1})	tesla (newton m^{-1} amp^{-1})
magnetic field	H	oersted (dyne esu^{-1})	amp m^{-1}
magnetic flux	Φ	gauss cm^2	weber (tesla m^2)
capacitance	C	cm	farad (ohm^{-1} sec)
inductance	L, M	cm^{-1} sec^2	henry (ohm sec)

1 coulomb = 3×10^9 esu

300 volts = 1 statvolt

1 tesla = 10^4 gauss

1 farad = 9×10^{11} cm

1 ampere = 3×10^9 esu sec^{-1}

3×10^4 volt m^{-1} = 1 statvolt cm^{-1}

1 ohm = 1.113×10^{-12} cm^{-1} sec

1 henry = 1.113×10^{-12} cm^{-1} sec^2

force on a moving charge

statvolt cm^{-1}

$$\mathbf{F} = q\left(\mathbf{E} + \frac{v}{c}\times\mathbf{B}\right)$$

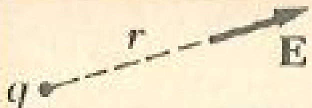
dyne esu gauss

volt m^{-1} tesla

$$\mathbf{F} = q\,(\mathbf{E} + v\times\mathbf{B})$$

newton coulomb m sec^{-1}

electric field of a charge



$$E = \frac{q}{r^2}$$

esu cm

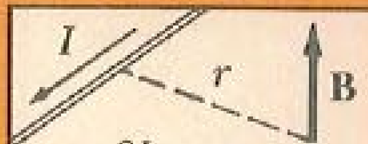
statvolt cm^{-1}

coulomb

$$E = \frac{q}{4\pi\epsilon_0 r^2}$$

volt m^{-1} m

magnetic field of a current



$$\mathbf{B} = \frac{2I}{cr}$$

esu sec^{-1} cm

gauss cm sec^{-1}

$$B = \frac{\mu_0 I}{2\pi r}$$

amp

tesla m

induced electromotive force

statvolt gauss cm^2

$$\mathcal{E} = -\frac{1}{c}\frac{d\Phi}{dt}$$

cm sec^{-1} sec

tesla m^2

$$\mathcal{E} = -\frac{d\Phi}{dt}$$

volt sec

energy density in the field

statvolt m^{-1} gauss

$$\frac{E^2}{8\pi}\ \text{erg cm}^{-3} \qquad \frac{B^2}{8\pi}\ \text{erg cm}^{-3}$$

volt m^{-1} tesla

$$\frac{\epsilon_0 E^2}{2}\ \text{joule m}^{-3} \qquad \frac{B^2}{2\mu_0}\ \text{joule m}^{-3}$$

$\epsilon_0 = 8.85\times10^{-12}$

$\mu_0 = 1.26\times10^{-6}$

PHYSICAL CONSTANTS

speed of light	c	299,792,458[†]	meter sec^{-1}
elementary charge	e	4.803×10^{-10}	esu
		1.602×10^{-19}	coulomb
electron mass	m_e	9.110×10^{-28}	gram
proton mass	m_p	1.673×10^{-24}	gram
Avogadro's number	N_0	6.022×10^{23}	$mole^{-1}$
Boltzmann constant	k	1.381×10^{-16}	erg $kelvin^{-1}$
Planck constant	h	6.626×10^{-27}	erg sec
gravitational constant	G	6.672×10^{-8}	$gram^{-1}\ cm^3\ sec^{-2}$
electron magnetic moment		9.285×10^{-21}	erg $gauss^{-1}$
proton magnetic moment		1.411×10^{-23}	erg $gauss^{-1}$

[†] The assignment of this exact value to c constitutes the new definition of the meter, as explained in Appendix E. The values of the other constants have here been arbitrarily rounded off to four digits. With the exception of the gravitational constant G they have all been determined experimentally with precision considerably better than that.

Edward P. Tryon
Sept. '84

Cylindrical Coordinates:

$$\vec{\nabla}\cdot\hat{\rho} = \frac{1}{\rho}, \quad \vec{\nabla}\times\hat{\rho} = 0 \,; \quad \vec{\nabla}\cdot\hat{\varphi} = 0, \quad \vec{\nabla}\times\hat{\varphi} = \frac{1}{\rho}\hat{z} \,; \quad \vec{\nabla}\cdot\hat{z} = \vec{\nabla}\times\hat{z} = 0$$

$$\frac{\partial\hat{\rho}}{\partial\rho} = 0, \quad \frac{\partial\hat{\rho}}{\partial\varphi} = \hat{\varphi}, \quad \frac{\partial\hat{\rho}}{\partial z} = 0; \quad \frac{\partial\hat{\varphi}}{\partial\rho} = 0, \quad \frac{\partial\hat{\varphi}}{\partial\varphi} = -\hat{\rho}, \quad \frac{\partial\hat{\varphi}}{\partial z} = 0;$$

$\hat{z}$ = constant.