The Role of the Number 12 in Physics

The number 12 is found not only as a factor but also as a power in different equations. Thus, the purpose of this article is to highlight the role of the number 12 in physics.

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1. Equations Containing the Number 12

The following is a list of equations containing the number 12:

1. Formula for the mean lifetime for the muon
Discovbered by: E. Fermi

$$\tau_\mu = \frac{12 \times 2^4 \pi^3 \hbar}{\left(\frac{G_F}{\hbar^3 c^3}\right)^2 \left(m_\mu c^2\right)^5}$$

2. Formula for the Casimir force:
Discovered by: H. Casimir

$$F_{cas} = \frac{\pi^2}{12 \times 20} \frac{\hbar c}{L^4} A$$

3. Formula for the electron spin g-factor:
Discovered by: the author [1]

$$g_e = 2\left(\sqrt[12]{\frac{1}{\alpha} - \frac{2}{\alpha^{0.5}} + \frac{1}{\alpha^{0.1}} + \frac{0.00002}{\alpha^{0.09}}}\right)$$

4. Numeric formula for the masses of particles (The "Alpha-12" mass formula)
(Valid for all particles whose rest mass, *m*, is grater than or equal to the proton rest mass)
Discovered by: the author [2]

$$m \approx \frac{m_e}{\alpha^{12}\left(\frac{M_P}{m_e}\right)\left[1-\alpha^{12}\left(\frac{M_P}{m_e}\right)\right]^n}$$

5. Formula for the mean lifetime of the delta minus particle
Discovered by: the author [3]

$$\tau_{\Delta^-} \approx \frac{1}{12}\frac{\hbar}{m_{\Delta^-}c^2}\frac{1}{\alpha}$$

6. Formula for the mean lifetime of the neutron
Discovered by: the author [3]

$$\tau_n \approx 11.369\left(\frac{m_n-m_p}{m_e-m_l}\right)\frac{\hbar}{m_n c^2}\frac{1}{\alpha^{12}}$$

The mean lifetime for the neutron turns out to be $\tau_n \approx 885.741\,S = 14.762\,min$

7. Formula for the mean lifetime of the proton
Discovered by: the author [3]

$$\tau_p \approx 12\left(\frac{m_n-m_p}{m_e-m_l}\right)\frac{\hbar}{m_p c^2}\frac{1}{\alpha^{12\left(\frac{m_n-m_p}{m_e-m_l}\right)}}$$

2. Conclusions

The number 12 plays an important role in physics both (a) as a factor and (b) as a power. The role of the number 12 as a factor is illustrated by four formulas: (1a) the formula for the mean lifetime for the muon, due to E. Fermi, (2a) The formula for the Casimir force, due to H. Casimir, (3a) the formula for the mean lifetime of the delta minus particle and (4a) The formula for the mean lifetime of the proton. The role of the number 12 as a power is illustrated by four formulas: (1b) the formula for the electron spin g-factor where the number 2 is raised to the power of 12, (2b) the numerical formula for the masses of particles where the fine-structure constant is raised to the power of 12, (3b) the formula for the mean lifetime of the neutron where the fine-structure constant is raised to the power of 12; and (4b) the formula for the mean lifetime of the proton where the fine-structure constant is raised to the power of 12 times the baryo-leptonic ratio. It is worthwhile to observe that the formula for the mean lifetime of the proton (formula 7) is the only formula in which the number 12 plays both abovementioned roles.

Appendix 1
Nomenclature

The following are the symbols used in this paper

c = speed of light in vacuum
h = Planck's constant
$\hbar$ = reduced Planck's constant $\left(\hbar = h/2\pi\right)$
L = separation between plates
A = area of the plate
G_F = Fermi constant
m_μ = muon rest mass
m_e = electron rest mass
m_l = electrino rest mass
m_n = neutron rest mass
m_p = proton rest mass
m_{Δ^-} = delta minus particle rest mass
m = rest mass of any particle heavier than or equal to the proton rest mass
M_p = Planck mass
τ_{Δ^-} = Delta minus particle mean lifetime
τ_n = neutron mean lifetime
τ_p = proton mean lifetime
α = fine structure constant, electromagnetic coupling constant, atomic structure constant.
F_{cas} = Casimir force
g_e = electron spin g-factor

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