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# Physical Quantities and Constants Equivalences Tables

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**Abstract**

The sequence for constructing the table of physical quantities and constants is presented. Planck and Stone units are used. A sequence of physical quantities is established, depending on time and space, to the corresponding powers, as well as a sequence of physical constants. In all tables, each physical quantity is presented in both Planck units and Stone units. A total of 192 physical quantities are presented, of which nine are already known, and 121 constants, of which eight are already known.
The proposed table can help classify physical quantities. The list of physical quantities and constants has been expanded.

***Keywords***: *Physical Quantities; Physical Constants; Table; Natural Units.*

## 1. Introduction

The systematic table of physical quantities and constants has historical roots in chemistry. Taking the systematic nature of Mendeleev's periodic table [1], [2] as the fundamental principle of the systematicity of the quantities and constants described in physics, an expanded list of physical quantities that can be used in physics is presented. The systems view of physical quantities and constants describes their interrelationships.

### 1.1. History

The fundamental periodic law of nature, discovered by D. I. Mendeleev in 1869, compares the properties of chemical elements and their atomic masses. [1] [2]
The Table of Limiting Values of Physical Quantities (Physical Constants), which compares the properties of physical quantities and space-time derivatives, was proposed in 2003. [3]
2014. Systematization of the Values of Fundamental Physical Constants. [4]
2016. Representation of Physical Quantities in Units of Space and Time. [5]
2024. Space-time and energy equivalence in algebraic form is the basis for describing physical quantities and constants in the table. [6]
2025. Equivalences of physical quantities and constants are described in algebraic form, which opens the way to describing these quantities and constants in a table. [7]

## 2. Methods

The main methods used are: algebra, analogies, equivalence of space-time and energy [6], and equivalence of physical quantities and constants. [7]

## 3. Examples

The table of physical quantities and constants, in which each column (group) of the table consists of a sequence with the base of space to the corresponding power (the number of factors of space), and the rows of the table define the magnitude of time and the inverse of time (frequency) to the corresponding power, of which only six are presented here, both for space and for frequency (time), taking into account the coefficients of their equivalences.

### 3.1. System of space-frequency

Table 1 presents 36 space-frequency dependencies using Planck quantities as an example: the reciprocal of space. $\ell_p^{-1}$ and space $\ell_p$ , and also of time $t_p$ and frequency $t_p^{-1}$ . This Table 1 contains six columns and six rows: a total of 36 cells in which physical quantities are written, six of which (along the diagonal of the table from the smallest value to the largest) represent 6 physical constants: $\frac{1}{c^2}$, $\frac{1}{c}$, 1, $c$, $c^2$ and $c^3$. Here c is the speed of light.

**Table 1:** Space – Frequency Physical Quantities

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_p^{-3}$ | $\frac{1}{t_p^3\ell_p^2}$ | $\frac{1}{t_p^3\ell_p}$ | $\frac{1}{t_p^3}$ | $\frac{c}{t_p^2}$ | $\frac{c^2}{t_p}$ | $c^3$ |
| $t_p^{-2}$ | $\frac{1}{t_p^2\ell_p^2}$ | $\frac{1}{\ell_p t_p^2}$ | $\frac{1}{t_p^2}$ | $\frac{c}{t_p}$ | $c^2$ | $c^2\ell_p$ |
| $t_p^{-1}$ | $\frac{1}{t_p\ell_p^2}$ | $\frac{1}{\ell_p t_p}$ | $\frac{1}{t_p}$ | $c$ | $c\ell_p$ | $c\ell_p^2$ |
| 1 | $\frac{1}{\ell_p^2}$ | $\frac{1}{\ell_p}$ | 1 | $\ell_p$ | $\ell_p^2$ | $\ell_p^3$ |
| $t_p$ | $\frac{1}{c\ell_p}$ | $\frac{1}{c}$ | $t_p$ | $\ell_p t_p$ | $\ell_p^2 t_p$ | $\ell_p^3 t_p$ |
| $t_p^2$ | $\frac{1}{c^2}$ | $\frac{t_p}{c}$ | $t_p^2$ | $\ell_p t_p^2$ | $\ell_p^2 t_p^2$ | $\ell_p^3 t_p^2$ |
| | $\ell_p^{-2}$ | $\ell_p^{-1}$ | 1 | $\ell_p$ | $\ell_p^2$ | $\ell_p^3$ |

Table 2 is compiled on the basis of Table 1 and presents 30 functional space–frequency (time) dependencies in Planck units. ($\ell_p - \omega_p$). [8]

**Table 2:** Space – Frequency Physical Quantities in Planck Units

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_p^{-3}$ | | | $\omega_p^3$ | $\frac{c^6}{\hbar G}$ | $\sqrt{\frac{c^9}{\hbar G}}$ | $c^3$ |
| $t_p^{-2}$ | | $\sqrt{\frac{c^{13}}{\hbar^3 G^3}}$ | $\omega_p^2$ | $a_p$ | $c^2$ | $\sqrt{c\hbar G}$ |
| $t_p^{-1}$ | $\sqrt{\frac{c^{11}}{\hbar^3 G^3}}$ | $\frac{c^4}{\hbar G}$ | $\omega_p$ | $c$ | $\sqrt{\frac{\hbar G}{c}}$ | $\frac{\hbar G}{c^2}$ |
| 1 | $\frac{c^3}{\hbar G}$ | $\sqrt{\frac{c^3}{\hbar G}}$ | 1 | $\ell_p$ | $S_p$ | $V_p$ |
| $t_p$ | $\sqrt{\frac{c}{\hbar G}}$ | $\frac{1}{c}$ | $\sqrt{\frac{\hbar G}{c^5}}$ | $\frac{\hbar G}{c^4}$ | $\sqrt{\frac{\hbar^3 G^3}{c^{11}}}$ | |
| $t_p^2$ | $\frac{1}{c^2}$ | $\sqrt{\frac{\hbar G}{c^7}}$ | $\frac{\hbar G}{c^5}$ | $\sqrt{\frac{\hbar^3 G^3}{c^{13}}}$ | | |
| | $\ell_p^{-2}$ | $\ell_p^{-1}$ | 1 | $\ell_p$ | $\ell_p^2$ | $\ell_p^3$ |

Here ħ is reduced Planck constant (Dirac constant), $G$ – gravitational constant.

Table 2 presents the physical constants: $\frac{1}{c^2}$, $\frac{1}{c}$, 1, $c$, $c^2$ and $c^3$ diagonally from ($\ell_p^{-2} - t_p^2$) to ($\ell_p^3 - t_p^{-3}$), as well as 8 generally accepted Planck physical quantities [8] in cells: ($\ell_p$ – 1) – Planck length is $\ell_p = \sqrt{\frac{\hbar G}{c^3}}$, ($\ell_p^2 - t_p^{-0}$) – Planck area is $S_p = \ell_p^2 = \frac{\hbar G}{c^3}$, ($\ell_p^3 - t_p^{-0}$) – Planck volume is $V_p = \ell_p^3 = \sqrt{\frac{\hbar^3 G^3}{c^9}}$, ($t_p$ – 1) – Planck time is $t_p = \sqrt{\frac{\hbar G}{c^5}}$, ($t_p^2$ – 1) – Planck time squared is $t_p^2 = \frac{\hbar G}{c^5}$, ($\ell_p^0 - t_p^{-1}$) – Planck angular frequency is $\frac{1}{t_p} = \omega_p = \sqrt{\frac{c^5}{\hbar G}}$, ($\ell_p^0 - t_p^{-2}$) – Planck angular acceleration is $\frac{1}{t_p^2} = \omega_p^2 = \frac{c^5}{\hbar G}$ and ($\ell_p - t_p^{-2}$) – Planck acceleration is $\frac{\ell_p}{t_p^2} = a_p = \sqrt{\frac{c^7}{\hbar G}}$.

Table 3 is compiled from Tables 1 and 2 and presents 30 space-frequency relationships in Stoney units. [8] Table 3 presents the physical constants: $\frac{1}{c^2}$, $\frac{1}{c}$, *1*, $c$, $c^2$ and $c^3$ diagonally from ($\ell_s^{-2} - t_s^2$) to ($\ell_s^3 - t_s^{-3}$), as well as eight generally accepted Stoney physical quantities [9] in cells: ($\ell_s - t_s^{-0}$) – Stoney Length is $\ell_s = \sqrt{\frac{G k_e e^2}{c^4}}$, ($\ell_s^2 - t_s^{-0}$) – Stoney area is $S_s = \ell_s^2 = \frac{G k_e e^2}{c^4}$, ($\ell_s^3 - t_s^{-0}$) – Stoney volume is $V_s = \ell_s^3 = \sqrt{\frac{G^3 k_e^3 e^6}{c^{12}}}$, ($t_s$ – *1*) – Stoney time is $t_s = \sqrt{\frac{G k_e e^2}{c^6}}$, ($t_p^2$ – *1*) – Stoney time squared is $t_p = \frac{G k_e e^2}{c^6}$, ($\ell_s^0 - t_s^{-1}$) – Stoney angular frequency is $\frac{1}{t_s} = \omega_s = \sqrt{\frac{c^6}{G k_e e^2}}$, ($\ell_s^0 - t_s^{-2}$) – Stoney angular acceleration is $\frac{1}{t_s^2} = \omega_s^2 = \frac{c^6}{G k_e e^2}$ and ($\ell_s - t_s^{-2}$) – Stoney acceleration is $\frac{\ell_s}{t_s^2} = a_s = \sqrt{\frac{c^8}{G k_e e^2}}$.

**Table 3:** Space – Frequency Physical Quantities in Stoney Units

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_s^{-3}$ | | | $\sqrt{\frac{c^{18}}{G^3 k_e^3 e^6}}$ | $\frac{c^7}{G k_e e^2}$ | $\sqrt{\frac{c^{10}}{G k_e e^2}}$ | $c^3$ |
| $t_s^{-2}$ | | $\sqrt{\frac{c^{16}}{G^3 k_e^3 e^6}}$ | $\omega_s^2$ | $a_s$ | $c^2$ | $\sqrt{G k_e e^2}$ |
| $t_s^{-1}$ | $\sqrt{\frac{c^{14}}{G^3 k_e^3 e^6}}$ | $\frac{c^5}{G k_e e^2}$ | $\omega_s$ | $c$ | $\sqrt{\frac{G k_e e^2}{c^2}}$ | $\frac{G k_e e^2}{c^3}$ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | $\frac{c^4}{G\,k_e\,e^2}$ | $\sqrt{\frac{c^4}{G\,k_e\,e^2}}$ | 1 | $\ell_s$ | $S_s$ | $V_s$ |
| $t_s$ | $\sqrt{\frac{c^2}{G\,k_e\,e^2}}$ | $\frac{1}{c}$ | $\sqrt{\frac{G\,k_e\,e^2}{c^6}}$ | $\frac{G\,k_e\,e^2}{c^5}$ | $\sqrt{\frac{k_e^3 G^3 e^6}{c^{14}}}$ | |
| $t_s^2$ | $\frac{1}{c^2}$ | $\sqrt{\frac{G\,k_e\,e^2}{c^8}}$ | $\frac{G\,k_e\,e^2}{c^6}$ | $\sqrt{\frac{k_e^3 G^3 e^6}{c^{16}}}$ | | |
| | $\ell_s^{-2}$ | $\ell_s^{-1}$ | 1 | $\ell_s$ | $\ell_s^2$ | $\ell_s^3$ |

Here $k_e$ is Coulomb constant, $e$ is electron charge.

## 3.2. Table of mass (space) – frequency

Table 4 in Planck quantities presents 30 mass (space) – frequency dependencies using the example of Planck quantities: mass is $m = k_{\ell m}\ell_p$ [7, equation (6)], [10, equation (54)] and frequency is $t_p^{-1}$ .

**Table 4:** Mass (Space) – Frequency Physical Quantities in Planck Units

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_p^{-3}$ | | | $\sqrt{\frac{c^{19}}{\hbar^3 G^5}}$ | $\frac{c^8}{\hbar G^2}$ | $\sqrt{\frac{c^{13}}{\hbar G^3}}$ | $L_p$ |
| $t_p^{-2}$ | | $\sqrt{\frac{c^{17}}{\hbar^3 G^5}}$ | $\frac{c^7}{\hbar G^2}$ | $a_{m_p}$ | $F_p$ | $E_p$ |
| $t_p^{-1}$ | $\sqrt{\frac{c^{15}}{\hbar^3 G^5}}$ | $\frac{c^6}{\hbar G^2}$ | $\sqrt{\frac{c^9}{\hbar G^3}}$ | $q_{m_p}$ | $cm_p$ | $\hbar$ |
| 1 | $\frac{c^5}{\hbar G^2}$ | $\sqrt{\frac{c^7}{\hbar G^3}}$ | $k_{\ell m}$ | $m_p$ | $\frac{\hbar}{c}$ | $\sqrt{\frac{\hbar^3 G}{c^5}}$ |
| $t_p$ | $\sqrt{\frac{c^5}{\hbar G^3}}$ | $\frac{c}{G}$ | $\sqrt{\frac{\hbar}{c\,G}}$ | $\frac{\hbar}{c^2}$ | $\sqrt{\frac{\hbar^3 G}{c^7}}$ | |
| $t_p^2$ | $\frac{1}{G}$ | $\sqrt{\frac{\hbar}{c^3\,G}}$ | $\frac{\hbar}{c^3}$ | $\sqrt{\frac{\hbar^3 G}{c^9}}$ | | |
| | $\ell_p^{-2}$ | $\ell_p^{-1}$ | 1<br>$k_{\ell m}=\frac{c^2}{G}$ | $\ell_p$ | $\ell_p^2$ | $\ell_p^3$ |

Here $k_{\ell m}$ is space-mass equivalence coefficient [7], $m_p$ is Planck mass, $F_p$ is Planck force, $E_p$ is Planck energy, $cm_p$ is Planck momentum and $L_p$ is Planck power. [8]
Table 4 contains six columns and six rows: a total of 30 cells in which physical quantities are recorded, six of which are along the diagonal of the table from the smallest value to the maximum: from $(k_{\ell m}\ell_p^{-2} - t_p^2)$ to $(k_{\ell m}\ell_p^3 - t_p^{-3})$, represent the six physical constants: $\frac{1}{G}$, $\frac{c}{G}$, $k_{\ell m}$ , Planck mass flow rate is $q_{m_p}=\frac{c^3}{G}$ , $F_p$ and $L_p$ , as well as 4 generally accepted Planck physical quantities in cells:

- $(k_{\ell m}\ell_p - t_p^0)$ – Planck mass is $m_p=\sqrt{\frac{\hbar c}{G}}$ ,
- $(k_{\ell m}\ell_p^2 - t_p^{-1})$ – Planck momentum is $cm_p=\sqrt{\frac{\hbar c^3}{G}}$ ,
- $(k_{\ell m}\ell_p^3 - t_p^{-2})$ – Planck energy is $E_p=c^2 m_p$ and
- $(k_{\ell m}\ell_p - t_p^{-2})$ – Planck mass flow acceleration is $a_{m_p}=\sqrt{\frac{c^{11}}{\hbar G^3}}$ .

Table 5 is compiled from Table 4 and presents 30 mass (space)–frequency relationships in Stoney units.

**Table 5:** Mass (Space) – Frequency Physical Quantities n Stoney Units

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_s^{-3}$ | | | $\sqrt{\frac{c^{22}}{G^5\,k_e^3\,e^6}}$ | $\frac{c^9}{G^2\,k_e\,e^2}$ | $\sqrt{\frac{c^{14}}{G^3\,k_e\,e^2}}$ | $L_s$ |
| $t_s^{-2}$ | | $\sqrt{\frac{c^{20}}{G^5\,k_e^3\,e^6}}$ | $\frac{c^8}{G^2\,k_e\,e^2}$ | $a_s$ | $F_p$ | $E_s$ |
| $t_s^{-1}$ | $\sqrt{\frac{c^{18}}{G^5\,k_e^3\,e^6}}$ | $\frac{c^7}{G^2\,k_e\,e^2}$ | $\omega_s$ | $q_{m_s}$ | $cm_s$ | $\frac{k_e\,e^2}{c}$ |
| 1 | $\frac{c^6}{G^2\,k_e\,e^2}$ | $\sqrt{\frac{c^8}{G^3\,k_e\,e^2}}$ | $k_{\ell m}$ | $m_s$ | $\frac{k_e\,e^2}{c^2}$ | $\sqrt{\frac{G\,k_e^3\,e^6}{c^8}}$ |
| $t_s$ | $\sqrt{\frac{c^6}{G^3\,k_e\,e^2}}$ | $\frac{c}{G}$ | $\sqrt{\frac{k_e\,e^2}{G\,c^2}}$ | $\frac{k_e\,e^2}{c^3}$ | $\sqrt{\frac{k_e^3 G e^6}{c^{10}}}$ | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_s^2$ | $\frac{1}{G}$ | $\sqrt{\frac{k_e\, e^2}{G\, c^4}}$ | $\frac{k_e\, e^2}{c^4}$ | $\sqrt{\frac{G\, k_e^3\, e^6}{c^{12}}}$ | | |
| | $\ell_s^{-2}$ | $\ell_s^{-1}$ | 1 | $\ell_s$ | $\ell_s^2$ | $\ell_s^3$ |
| | | | $k_{\ell m}=\frac{c^2}{G}$ | | | |

Here $k_{\ell m}$ is space-mass equivalence coefficient [7], $m_s$ is Stoney mass, $F_p$ is Planck force, $E_s$ is Stoney energy, $cm_s$ is Stoney momentum and $L_s$ is Stoney power [9]. Table 5 contains six columns and six rows, of which there are a total of 30 cells in which physical quantities are recorded, six of which are along the diagonal of the table from the smallest value to the maximum: from $(k_{\ell m}\ell_s^{-2} - t_s^2)$ to $(k_{\ell m}\ell_s^3 - t_s^{-3})$, represent 6 physical constants: $\frac{1}{G}$, $\frac{c}{G}$, $k_{\ell m}$, $q_{m_s}=q_{m_p}=\frac{c^3}{G}$, $F_p$ and $L_s=L_p$ . This diagonal of constants repeats the diagonal in Table 4 in Planck units. Table 5 also contains the four commonly used Stoney physical quantities in cells: $(k_{\ell m}\ell_p - t_p^0)$ – Stoney mass is $m_s=\sqrt{\frac{k_e e^2}{G}}$, $(k_{\ell m}\ell_p^2 - t_p^{-1})$ – Stoney impulse is $cm_s=c\sqrt{\frac{k_e e^2}{G}}$ , $(k_{\ell m}\ell_p^3 - t_p^{-2})$ – Stoney energy is $E_s=c^2 m_s=c^2\sqrt{\frac{k_e e^2}{G}}$ and $(k_{\ell m}\ell_s - t_s^{-2})$ – Stoney mass flow acceleration is $a_{m_p}=\sqrt{\frac{c^8}{G\, k_e\, e^2}}$ .

### 3.3. Table of electric charge (space) – frequency

Table 6 presents 30 electric charge (space)–frequency relationships using Planck quantities as an example. This Table 6 contains six columns and six rows: a total of 36 cells, 30 of which contain physical quantities, six of which (along the diagonal of the table from the smallest value to the largest) represent six physical constants.

**Table 6:** Electric Charge (Space) – Frequency Physical Quantities in Planck Units

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_p^{-3}$ | | | $\sqrt{\frac{c^{19}}{\hbar^3 G^4 k_e}}$ | $\sqrt{\frac{c^{16}}{\hbar^2 k_e G^3}}$ | $\sqrt{\frac{c^{13}}{\hbar k_e G^2}}$ | $c^2 I_o$ |
| $t_p^{-2}$ | | $\sqrt{\frac{c^{17}}{\hbar^3 G^4 k_e}}$ | $\sqrt{\frac{c^{14}}{\hbar^2 k_e G^3}}$ | $\sqrt{\frac{c^{11}}{\hbar k_e G^2}}$ | $cI_o$ | $\sqrt{\frac{\hbar c^5}{k_e}}$ |
| $t_p^{-1}$ | $\sqrt{\frac{c^{15}}{\hbar^3 G^4 k_e}}$ | $\sqrt{\frac{c^{12}}{\hbar^2 k_e G^3}}$ | $\sqrt{\frac{c^9}{\hbar k_e G^2}}$ | $I_o$ | $\sqrt{\frac{\hbar c^3}{k_e}}$ | $\sqrt{\frac{\hbar^2 G}{k_e}}$ |
| 1 | $\sqrt{\frac{c^{10}}{\hbar^2 k_e G^3}}$ | $\sqrt{\frac{c^7}{\hbar k_e G^2}}$ | $k_{\ell Q}$ | $Q_p$ | $\sqrt{\frac{\hbar^2 G}{k_e c^2}}$ | $\sqrt{\frac{\hbar^3 G^2}{k_e c^5}}$ |
| $t_p$ | $\sqrt{\frac{c^5}{\hbar k_e G^2}}$ | $\sqrt{\frac{c^2}{G k_e}}$ | $\sqrt{\frac{\hbar}{c k_e}}$ | $\sqrt{\frac{\hbar^2 G}{c^4 k_e}}$ | $\sqrt{\frac{\hbar^3 G^2}{k_e c^7}}$ | |
| $t_p^2$ | $\sqrt{\frac{1}{G k_e}}$ | $\sqrt{\frac{\hbar}{k_e c^3}}$ | $\sqrt{\frac{\hbar^2 G}{k_e c^6}}$ | $\sqrt{\frac{\hbar^3 G^2}{k_e c^9}}$ | | |
| | $\ell_p^{-2}$ | $\ell_p^{-1}$ | 1 | $\ell_p$ | $\ell_p^2$ | $\ell_p^3$ |
| | | | $k_{\ell Q}=\sqrt{\frac{c^4}{G k_e}}$ | | | |

Table 6 lists physical constants: $\sqrt{\frac{1}{G k_e}}$, $\sqrt{\frac{c^2}{G k_e}}$, $k_{\ell Q}$ , $I_o$ , $cI_o$ and $c^2 I_o$ diagonally from $(k_{\ell Q}\ell_p^{-2} - t_p^2)$ to $(k_{\ell Q}\ell_p^3 - t_p^{-3})$, and also 2 physical quantities are presented: $(k_{\ell Q}\ell_p - t_p^0)$ electric charge is $Q_p=\frac{I_o}{c}\ell_p=\sqrt{\frac{\hbar c}{k_e}}$ [10, equation (7.2)] and $(k_{\ell Q}\ell_p - t_p^{-1})$ electric current is $I_o=\sqrt{\frac{c^6}{G k_e}}$ [11, equations (11), (74)]. Table 7 is compiled on the basis of Table 6 and presents 30 electric charge (space)–frequency dependencies in Stoney units.

**Table 7:** Electric Charge (Space) – Frequency Physical Quantities in Stoney Units

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_s^{-3}$ | | | $\frac{c^{11}}{G^2\, k_e^2\, e^3}$ | $\sqrt{\frac{c^{18}}{G^3\, k_{e^2}\, e^4}}$ | $\frac{c^7}{G\, k_e\, e}$ | $c^2 I_o$ |
| $t_s^{-2}$ | | $\frac{c^{10}}{G^2\, k_e^2\, e^3}$ | $\sqrt{\frac{c^{16}}{G^3\, k_e^3\, e^4}}$ | $\frac{c^6}{G\, k_e\, e}$ | $cI_o$ | $ec^2$ |
| $t_s^{-1}$ | $\frac{c^9}{G^2\, k_e^2\, e^3}$ | $\sqrt{\frac{c^{14}}{G^3\, k_e^3\, e^4}}$ | $\frac{c^5}{G\, k_e\, e}$ | $I_o$ | $ec$ | $\sqrt{\frac{G\, k_e\, e^4}{c^2}}$ |
| 1 | $\sqrt{\frac{c^{12}}{G^3\, k_e^3\, e^4}}$ | $\frac{c^4}{G\, k_e\, e}$ | $k_{\ell Q}$ | $e$ | $\sqrt{\frac{G\, k_e\, e^4}{c^4}}$ | $\frac{G\, k_e\, e^3}{c^4}$ |
| $t_s$ | $\frac{c^3}{G\, k_e\, e}$ | $\sqrt{\frac{c^2}{G k_e}}$ | $\frac{e}{c}$ | $\sqrt{\frac{G\, k_e\, e^4}{c^6}}$ | $\frac{G\, k_e\, e^3}{c^5}$ | |
| $t_s^2$ | $\sqrt{\frac{1}{G k_e}}$ | $\frac{e}{c^2}$ | $\sqrt{\frac{G\, k_e\, e^4}{c^8}}$ | $\frac{G\, k_e\, e^3}{c^6}$ | | |
| | $\ell_s^{-2}$ | $\ell_s^{-1}$ | 1 | $\ell_s$ | $\ell_s^2$ | $\ell_s^3$ |

$k_{\ell Q}=\sqrt{\frac{c^4}{Gk_e}}$

Table 7 presents the physical constants: $\sqrt{\frac{1}{Gk_e}}$, $\sqrt{\frac{c^2}{Gk_e}}$, $k_{\ell Q}$ , $I_o$ , $cI_o$ and $c^2 I_o$ . Diagonally from ($k_{\ell Q}\ell_s^{-2} - t_p^2$) to ($k_{\ell Q}\ell_p^3 - t_p^{-3}$), which corresponds to Table 6, and also presents two generally accepted physical quantities: ($k_{\ell Q}\ell_s - t_s^0$) Stoney electric charge – electron electric charge is e and ($k_{\ell Q}\ell_p - t_p^{-1}$) Planck and Stoney electric current is $I_o=\sqrt{\frac{c^6}{Gk_e}}$ (electric current in natural units) [11, equations (7.0), (74)].

### 3.4. System of magnetic flux (space)–frequency

Table 8 presents 30 magnetic flux (space)–frequency (time) dependencies using Planck quantities as an example, and is constructed by analogy with Table 6, taking into account the analogy of the constructions of Tables 1–5, with the equivalence coefficient – magnetic flux–space $\boldsymbol{k_{\ell\Phi}}=\sqrt{\frac{k_e c^2}{G}}$ [11]. This Table 8 contains six columns and six rows: a total of 36 cells in which physical quantities are written, six of which (along the diagonal of the table from the smallest value to the largest) represent 6 physical constants: $\sqrt{\frac{k_e}{c^2 G}}$ , $\sqrt{\frac{k_e}{G}}$ , $\boldsymbol{k_{\ell\Phi}}$ , $\boldsymbol{U_o} = \sqrt{\frac{c^4 k_e}{G}}$ [11, equation (80)], $\boldsymbol{cU_o}$ **and** $\boldsymbol{c^2U_o}$ . Table 8 presents a commonly accepted physical quantity – the Planck magnetic flux $\Phi_{\boldsymbol{p}}=\sqrt{\frac{\hbar k_e}{c}}$ . [11, equation (13)]

**Table 8:** Physical Quantities: Magnetic Flux (Space) – Frequency in Planck Units

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_p^{-3}$ | | | $\sqrt{\frac{k_e c^{17}}{\hbar^3 G^4}}$ | $\sqrt{\frac{k_e c^{14}}{\hbar^2 G^3}}$ | $\sqrt{\frac{k_e c^{11}}{\hbar G^2}}$ | $c^2 U_o$ |
| $t_p^{-2}$ | | $\sqrt{\frac{k_e c^{15}}{\hbar^3 G^4}}$ | $\sqrt{\frac{k_e c^{12}}{\hbar^2 G^3}}$ | $\sqrt{\frac{k_e c^{9}}{\hbar G^2}}$ | $cU_o$ | $\sqrt{c^3\hbar k_e}$ |
| $t_p^{-1}$ | $\sqrt{\frac{k_e c^{13}}{\hbar^3 G^4}}$ | $\sqrt{\frac{k_e c^{10}}{\hbar^2 G^3}}$ | $\sqrt{\frac{k_e c^{7}}{\hbar G^2}}$ | $U_o$ | $\sqrt{c\hbar k_e}$ | $\sqrt{\frac{\hbar^2 k_e G}{c^2}}$ |
| 1 | $\sqrt{\frac{k_e c^{8}}{\hbar^2 G^3}}$ | $\sqrt{\frac{k_e c^{5}}{\hbar G^2}}$ | $k_{\ell\Phi}$ | $\Phi_p$ | $\sqrt{\frac{\hbar^2 k_e G}{c^4}}$ | $\sqrt{\frac{k_e \hbar^3 G^2}{c^7}}$ |
| $t_p$ | $\sqrt{\frac{k_e c^{3}}{\hbar G^2}}$ | $\sqrt{\frac{k_e}{G}}$ | $\sqrt{\frac{\hbar\, k_e}{c^3}}$ | $\sqrt{\frac{\hbar^2 k_e G}{c^6}}$ | $\sqrt{\frac{k_e \hbar^3 G^2}{c^9}}$ | |
| $t_p^2$ | $\sqrt{\frac{k_e}{c^2\, G}}$ | $\sqrt{\frac{\hbar\, k_e}{c^5}}$ | $\sqrt{\frac{\hbar^2 k_e G}{c^8}}$ | $\sqrt{\frac{k_e \hbar^3 G^2}{c^{11}}}$ | | |
| | $\ell_p^{-2}$ | $\ell_p^{-1}$ | 1 | $\ell_p$ | $\ell_p^2$ | $\ell_p^3$ |
| | | | $k_{\ell\Phi}=\sqrt{\frac{k_e\, c^2}{G}}$ | | | |

Table 9 is compiled on the basis of Table 8 and presents 30 magnetic flux (space)–frequency (time) dependencies in Stoney units. Table 9 presents the physical constants: $\sqrt{\frac{k_e}{c^2\, G}}$, $\sqrt{\frac{k_e}{G}}$, $k_{\ell\Phi}$ , $U_o = \sqrt{\frac{c^4\, k_e}{G}}$ [11, equation (80)], $cU_o$ and $c^2 U_o$ . Diagonally from ($k_{\ell\Phi}\ell_s^{-2} - t_s^2$) to ($k_{\ell\Phi}\ell_s^3 - t_s^{-3}$), which repeats the same diagonal in Table 8. In the cell ($k_{\ell Q}\ell_s - t_s^0$) is presented a generally accepted physical quantity – Stone's magnetic flux $\Phi_s=\frac{e\, k_e}{c}$ [11, equation (10.1)].

**Table 9:** Physical Quantities: Magnetic Flux (Space) – Frequency in Stoney Units

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_s^{-3}$ | | | $\frac{c^{10}}{G^2 k_e e^3}$ | $\frac{c^8}{e^2}\sqrt{\frac{1}{G^3 k_e}}$ | $\frac{c^6}{Ge}$ | $c^2 U_o$ |
| $t_s^{-2}$ | | $\frac{c^9}{G^2 k_e e^3}$ | $\sqrt{\frac{c^{14}}{G^3 k_e e^4}}$ | $\frac{c^5}{Ge}$ | $cU_o$ | $cek_e$ |
| $t_s^{-1}$ | $\frac{c^8}{G^2 k_e e^3}$ | $\sqrt{\frac{c^{12}}{G^3 k_e e^4}}$ | $\frac{c^4}{Ge}$ | $U_o$ | $ek_e$ | $\sqrt{\frac{Ge^4 k_e^3}{c^4}}$ |
| $t_s^0$ | $\sqrt{\frac{c^{10}}{G^3 k_e e^4}}$ | $\frac{c^3}{Ge}$ | $k_{\ell\Phi}$ | $\Phi_s$ | $\sqrt{\frac{Ge^4 k_e^3}{c^6}}$ | $\frac{Ge^3 k_e^2}{c^5}$ |
| $t_s$ | $\frac{c^2}{Ge}$ | $\sqrt{\frac{k_e}{G}}$ | $\frac{ek_e}{c^2}$ | $\sqrt{\frac{Ge^4 k_e^3}{c^8}}$ | $\frac{Ge^3 k_e^2}{c^4}$ | |
| $t_s^2$ | $\sqrt{\frac{k_e}{c^2 G}}$ | $\frac{ek_e}{c^3}$ | $\sqrt{\frac{Ge^4 k_e^3}{c^{10}}}$ | $\frac{Ge^3 k_e^2}{c^3}$ | | |
| | $\ell_s^{-2}$ | $\ell_s^{-1}$ | 1 | $\ell_s$ | $\ell_s^2$ | $\ell_s^3$ |
| | | | $k_{\ell\Phi}=\sqrt{\frac{k_e\, c^2}{G}}$ | | | |

### 3.5. Table of physical quantities

Table 10, constructed on the basis of equivalences of nine physical quantities [7, equation (1)], presents 72 physical constants, of which 15 are known constants. This Table 10, by analogy with Tables 1–9, is compiled with an extension for systems in the form of equivalent dependencies of the square root of the magnetic moment (space) – frequency ($k_{\ell\sqrt{m}}$), electrical capacitance (space) – frequency ($k_{\ell C}$) and electrical inductance (space) – frequency ($k_{\ell L}$). Given that $k_{\ell\sqrt{m}}=\sqrt{I_o}$ [7, equation (8.2)], $k_{\ell C}=\frac{1}{k_e}$ [7, equation (9)], $k_{\ell L}=\frac{k_e}{c^2}$ [7, equation (10)]. In total, nine equivalent physical quantities were considered:

$$\Phi - E - T - L - m - Q - \sqrt{m} - C - L \quad (1)$$

63 physical constants in Table 10 are equivalence coefficients of physical quantities (1). Table 10 presents 63 constants out of 184 equivalence coefficients (constants) of physical quantities and constants. [7, equations (1) – (10.2)]

**Table 10:** Physical Quantities Equivalence Table

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $\boldsymbol{L}$ [7, (10.2)] | $\frac{1}{I_o}$ | $\frac{1}{I_o^2}$ | $R_o$ | $\frac{R_o}{c}$ | $\frac{c^2}{I_o^2}$ | $\frac{R_o}{I_o}$ | $\sqrt{\frac{R_o^2}{c^2 I_o}}$ | $R_o^2$ | 1 |
| $C$ [7, (9.1)] | $\frac{1}{R_o U_o}$ | $\frac{1}{U_o^2}$ | $\frac{1}{R_o}$ | $\frac{1}{cR_o}$ | $\frac{c^2}{U_o^2}$ | $\frac{1}{U_o}$ | $\frac{1}{c\sqrt{R_o U_o}}$ | 1 | $\frac{1}{R_o^2}$ |
| $\sqrt{\boldsymbol{m}}$ [7, (8.2)] | $\sqrt{\frac{c^2}{U_o R_o}}$ | $\sqrt[4]{\frac{G^3}{R_o c^{11}}}$ | $\sqrt[4]{\frac{F_p c^5}{R_o}}$ | $\sqrt{I_o}$ | $\sqrt{\frac{R_o c^6}{U_o^3}}$ | $\sqrt{\frac{c^2}{I_o}}$ | 1 | $\sqrt{U_o R_o c^2}$ | $\frac{\sqrt{c^2 I_o}}{R_o}$ |
| $Q$ [7, (7.2)] | $\frac{1}{R_o}$ | $\frac{1}{U_o}$ | $I_o$ | $\frac{I_o}{c}$ | $\frac{c^2}{U_o}$ | 1 | $\sqrt{\frac{I_o}{c^2}}$ | $U_o$ | $\frac{I_o}{R_o}$ |
| $m$ [7, (6.1)] | $\frac{I_o}{c^2}$ | $\frac{1}{c^2}$ | $\frac{F_p}{c}$ | $\frac{F_p}{c^2}$ | 1 | $\frac{U_o}{c^2}$ | $\sqrt{\frac{U_o}{c\,G}}$ | $\frac{U_o^2}{c^2}$ | $\frac{I_o^2}{c^2}$ |
| $L$ [7, (5.2)] | $\frac{c}{U_o}$ | $\frac{1}{F_p}$ | $c$ | 1 | $\frac{c^2}{F_p}$ | $\frac{c}{I_o}$ | $\frac{1}{\sqrt{I_o}}$ | $cR_o$ | $\frac{c}{R_o}$ |
| $T$ [7, (4.1)] | $\frac{1}{U_o}$ | $\frac{1}{c F_p}$ | 1 | $\frac{1}{c}$ | $\frac{c}{F_p}$ | $\frac{1}{I_o}$ | $\frac{1}{c\sqrt{I_o}}$ | $R_o$ | $\frac{1}{R_o}$ |
| $E$ [7, (2.1)] | $I_o$ | 1 | $cF_p$ | $F_p$ | $c^2$ | $U_o$ | $\sqrt[4]{\frac{F_p^3 R_o}{c}}$ | $U_o^2$ | $I_o^2$ |
| $\Phi$ [7, (3.2)] | 1 | $\frac{1}{I_o}$ | $U_o$ | $\frac{U_o}{c}$ | $\frac{c^2}{I_o}$ | $R_o$ | $\sqrt{\frac{R_o U_o}{c^2}}$ | $U_o R_o$ | $I_o$ |
| | $\Phi$ | $E$ | $T$ | $L$ | $m$ | $Q$ | $\sqrt{\boldsymbol{m}}$ | $C$ | $\boldsymbol{L}$ |

It should be noted that the equivalences: $C = R_o T$ and $T = R_o L$ $(C - T - L)$ have the same equivalence coefficient $k_{CT} = k_{TL} = R_o$, and $k_{CL} = R_o^2$ or $C = R_o^2 L$. Also equivalences: $L - \Phi - E$ have an equivalence coefficient $k_{L\Phi} = k_{\Phi E} = I_o$, and the equivalence coefficient $k_{LE} = I_o^2$, from here $L = I_o^2 E$. Further equivalences $L - T - C$ with a step coefficient $\frac{1}{R_o}$ and the resulting coefficient $\frac{1}{R_o^2}$ for equivalence $L - C$. Same for $E - \Phi - L$ with coefficients $k_{E\Phi} = k_{\Phi L} = \frac{1}{I_o}$ and with the resulting coefficient $k_{EL} = \frac{1}{I_o^2}$ for $E - L$. For $C - Q - E$ step coefficient is $k_{CQ} = k_{QE} = U_o$, and for equivalence $\mathrm{C} - \mathrm{E}$ resulting coefficient is $\mathrm{k_{CE}} = \mathrm{U_o^2}$. This coefficient will be obtained from a sequence of equivalences: $C - T - L - \Phi - E$, namely $k_{CE} = k_{CT} \times k_{TL} \times k_{L\Phi} \times k_{\Phi E} = U_o^2$.

### 3.6. Periodic table of physical constants

Table 11 presents 49 physical constants, 15 of which are known constants. This Table 11 is compiled based on the constant diagonals (from the lower left corner to the upper right corner) in Tables 1–9 and takes into account Table 10.

**Table 11:** Equivalence Coefficient Table

| | | | | | | |
|---|---|---|---|---|---|---|
| $\frac{c^2}{G}$ | $\frac{1}{G}$ | $\frac{c}{G}$ | $k_{\ell m}$ | $q_m$ | $F_p$ | $L_p$ |
| $\sqrt{\frac{c^4}{Gk_e}}$ | $\sqrt{\frac{1}{Gk_e}}$ | $\sqrt{\frac{c^2}{Gk_e}}$ | $k_{\ell Q}$ | $I_o$ | $cI_o$ | $c^2 I_o$ |
| $\sqrt{\frac{k_e c^2}{G}}$ | $\sqrt{\frac{k_e}{c^2 G}}$ | $\sqrt{\frac{k_e}{G}}$ | $k_{\ell\Phi}$ | $U_o$ | $cU_o$ | $c^2 U_o$ |
| $\sqrt{I_o}$ | $\frac{\sqrt{I_o}}{c^2}$ | $\frac{\sqrt{I_o}}{c}$ | $k_{\ell\sqrt{m}}$ | $c\sqrt{I_o}$ | $c^2\sqrt{I_o}$ | $c^3\sqrt{I_o}$ |
| $\frac{k_e}{c^2}$ | $\frac{k_e}{c^4}$ | $\frac{k_e}{c^3}$ | $k_{\ell L}$ | $R_o$ | $cR_o$ | $c^2 R_o$ |
| $\frac{1}{k_e}$ | $\frac{1}{c^2 k_e}$ | $\frac{1}{ck_e}$ | $k_{\ell C}$ | $\frac{1}{R_o}$ | $\frac{1}{k_{\ell L}}$ | $\frac{c^2}{R_o}$ |
| 1 | $c^{-2}$ | $c^{-1}$ | 1 | $c$ | $c^2$ | $c^3$ |

From this it is clear that: $k_{\ell Q}=\sqrt{\frac{k_{\ell m}}{k_{\ell L}}}$, $k_{\ell\Phi}=\sqrt{k_e\ k_{\ell m}}$ .

The description of the relationships between constants does not end there. The next step is to describe the equivalences of all eight physical constants listed here: [7, equation (82.1)]

$$G - R_o - k_\Phi - c - k_e - I_o - U_o - F_p \quad (2)$$

Table 12 presents 49 physical constants derived from the eight fundamental physical constants. This table is compiled based on and taking into account Tables 1–10, taking into account the equivalence of the eight physical constants (4).
Table 12 shows that with the proposed form of recording constants, the most frequently used coefficients are the speed of light c (30 applications), current constant (14 applications), electrical resistance constant (13 applications), Planck force (12 applications), electrical voltage constant and gravitational constant (9 applications).

**Table 12:** Physical Constants Equivalence Table

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $F_p$ [7, (96)] | $\frac{c^4}{G^2}$ | $\frac{U_o^2\ R_o\ c^2}{k_e^3}$ | $\frac{I_o^2}{k_\Phi^2}$ | $\frac{c^3}{G}$ | $\frac{I^2}{c^2}$ | $\frac{U_o}{c}$ | $\frac{I_o}{c}$ | 1 |
| $U_o$ [7, (98)] | $\sqrt{\frac{k_e c^4}{G^3}}$ | $I_o$ | $\frac{I_o R_o}{k_\Phi}$ | $\sqrt{\frac{F_p}{k_\Phi}}$ | $\sqrt{\frac{F_p}{k_e}}$ | $R_o$ | 1 | $\sqrt{\frac{k_e}{F_p}}$ |
| $I_o$ [7, (97)] | $\sqrt{\frac{c^6}{G^3 k_e}}$ | $\sqrt{\frac{c^4 F_p}{k_e^3}}$ | $\sqrt{\frac{F_p}{k_\Phi}}$ | $\sqrt{\frac{F_p}{k_e}}$ | $\frac{I_o}{k_e}$ | 1 | $\frac{1}{R_o}$ | $\frac{c^2}{I_o^2}$ |
| $k_e$ [7, (93)] | $\frac{U_o^2}{c^4}$ | $c$ | $R_o^2$ | $R_o$ | 1 | $\frac{U_o^5\ G^3}{R_o c^{14}}$ | $\frac{c}{I_o}$ | $\frac{c^2}{I_o^2}$ |
| $c$ [7, (92)] | $\frac{k_e}{G R_o}$ | $k_\Phi$ | $R_o$ | 1 | $\frac{1}{R_o}$ | $\sqrt{\frac{k_e}{F_p}}$ | $\sqrt{\frac{k_\Phi}{F_p}}$ | $\frac{k_e}{F_p R_o}$ |
| $k_\Phi$ [7, (94)] | $\frac{I_o^2}{c^4}$ | $\frac{R_o\ c^{16}}{U_o^6\ G^3}$ | 1 | $\frac{1}{R_o}$ | $\frac{1}{R_o^2}$ | $\frac{I_o}{F_p}$ | $\frac{U_o\ c}{R_o}$ | $\frac{c^2}{U_o^2}$ |
| $R_o$ [7, (99)] | $\frac{G^2 k_e F_p^3}{c^{13}}$ | 1 | $\frac{k_e}{c\ k_\Phi}$ | $\frac{1}{k_\Phi}$ | $\frac{1}{c}$ | $U_o$ | $\frac{1}{I_o}$ | $\frac{G^3 k_e F_p^2}{c^{13}}$ |
| $G$ [7, (95)] | 1 | $\frac{c^5}{U_o^2}$ | $\frac{c^4}{I_o^2}$ | $\frac{c^3}{F_p}$ | $\frac{c^4}{U_o^2}$ | $\frac{k_e^3\ c^2\ I_o}{U_o^4}$ | $\frac{c^5}{I_o\ U_o^2}$ | $\frac{c^4}{F_p^2}$ |
| | $G$ | $R_o$ | $k_\Phi$ | $c$ | $k_e$ | $I_o$ | $U_o$ | $F_p$ |

Table 12 shows the functional relationship between physical constants. [12]

## 4. Conclusion

The manuscript presents 12 tables, the final two of which, Tables 10 and 12, are compiled based on equations equivalences of physical quantities and constants [7, equations (1) – (10.2) and (92) – (99)].
The first Tables 1–9 represent the sequence of compilation of Tables 10 and 12 in natural units.
In both cases, the same result was obtained, indicating the correct compilation of Tables 1–9 and the results obtained using them.
Tables 1–9 indicate 192 physical quantities, of which nine are already known, and 121 constants, of which eight are already known. Therefore, Tables 1–9 have been presented in this manuscript. New physical quantities and constants are only presented as equations based on the constants.
The Table of Physical Quantities and Constants is a classification of physical quantities and constants that establishes the dependence of various properties of physical quantities on the constants of time and space to the appropriate powers, and the properties of physical constants on the speed of light to the appropriate powers, as well as equivalence coefficients of physical quantities. Classifications of physical quantities from constants, as well as physical constants from other constants, are presented.
The tables provided here allow one to find functional relationships of known physical quantities and constants, and also to establish equivalences of physical constants.
Physical quantities, based on their mutual equivalence, represent a field of physical quantities interacting with each other based on a field of physical constants.

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