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Short Note

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On Filling Energy Levels and Sub-Levels

*Z. V. Pachulia**

Faculty of Natural Sciences, Mathematics, Technology and Pharmacy, Sokhumi State University, 0186 Tbilisi, Georgia

As it is known, the filling of energy levels and sub-levels is produced in accordance with V. M. Klechkowski I and II rules [1-3], which are based on the two solutions of the E. Schroedinger equation [4-5] – the principal n and the orbital l quantum numbers, but nothing is said about the third solution – the magnetic m_l quantum number. It is true that the order obtained by increasing the energy corresponds to the experimental data, but in our opinion it is better to use a single unified rule in which to the sum of the quantum numbers (n and l) will be added the third term. The third solution of the Schroedinger equation m_l determines the number of orbitals on the sub-levels $k_{m_l}\left[k_{m_l}(s)=1, k_{m_l}(p)=3, k_{m_l}(d)=5, k_{m_l}(f)=7\right]$. Our input is to add the inverse values of these numbers (1, 3, 5 and 7) $\frac{1}{k_{m_l}} - 1, 0.33, 0.2$ and 0.14 to this sum. With this in mind, the sum of three numbers $\left(\Sigma = n + l + \frac{1}{k_{m_l}}\right)$ for all sub-levels of the 7 periods of the periodic table of the elements is given in Table 1.

Table 1: The sum of three numbers for all sub-levels of the 7 periods of the periodic table of the elements is given in the table.

sub-level	n	l	k_{m_l}	$\frac{1}{k_{m_l}}$	Σ
1s	1	0	1	1	2
2s	2	0	1	1	3
2p	2	1	3	0.33	3.33
3s	3	0	1	1	4
3p	3	1	3	0.33	4.33
3d	3	2	5	0.2	5.2
4s	4	0	1	1	5
4p	4	1	3	0.33	5.33
4d	4	2	5	0.2	6.2
4f	4	3	7	0.14	7.14
5s	5	0	1	1	6
5p	5	1	3	0.33	6.33
5d	5	2	5	0.2	7.2
5f	5	3	7	0.14	8.14
6s	6	0	1	1	7
6p	6	1	3	0.33	7.33
6d	6	2	5	0.2	8.2
6f	6	3	7	0.14	9.14
7s	7	0	1	1	8
7p	7	1	3	0.33	8.33
7d	7	2	5	0.2	9.2
7f	7	3	7	0.14	10.14

Table 2: The layout of the sub-levels according to the sum increase is given in the table.

sub-level	n	l	k_{m_l}	$\frac{1}{k_{m_l}}$	Σ
1s	1	0	1	1	2
2s	2	0	1	1	3
2p	2	1	3	0.33	3.33
3s	3	0	1	1	4
3p	3	1	3	0.33	4.33
4s	4	0	1	1	5
3d	3	2	5	0.2	5.2
4p	4	1	3	0.33	5.33
5s	5	0	1	1	6
4d	4	2	5	0.2	6.2
5p	5	1	3	0.33	6.33
6s	6	0	1	1	7
4f	4	3	7	0.14	7.14
5d	5	2	5	0.2	7.2
6p	6	1	3	0.33	7.33

***Corresponding author:** Z. V. Pachulia, Faculty of Natural Sciences, Mathematics, Technology and Pharmacy, Sokhumi State University, 0186 Tbilisi, Georgia

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7s	7	0	1	1	8
5f	5	3	7	0.14	8.14
6d	6	2	5	0.2	8.2
7p	7	1	3	0.33	8.33
6f	6	3	7	0.14	9.14
7d	7	2	5	0.2	9.2
7f	7	3	7	0.14	10.14

The layout of the sub-levels according to the sum increase is given in Table 2.

The new filling rule will be formulated as follows:

The electron sub-levels are filled in accordance with the sum of the principal n, the orbital l quantum numbers and the inverse values of the number of orbitals on the sub-level - $\sum = n + l + \frac{1}{k_{m_l}}$**.**

Based on this, the principle of least energy is formed:

The electronic sub-levels are arranged in the following order according to the energy increase:

1s < 2s < 2p < 3s < 3p < 4s < 3d < 4p < 5s < 4d < 5p < 6s < 4f < 5d < 6p < 7s < 5f < 6d < 7p < 6f < 7d < 7f.

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