Editorial

A PROPOSAL FOR A NEW PERIODIC TABLE OF THE ELEMENTS

RAMDANE QUAHES*

SUMMARY: A new periodic table is proposed consisting of 8 periods instead of 7. A period of rank k correspond to the completion of shells and sub-shells according to the relationship n+1= k between quantic numbers. The new proposed chart eliminates the defects of the present table and, hence, has didactic advantages.

Key Word: Periodic table.

The periodic table of elements, introduced by Mendeleav (1) in 1869, was based on the following statement: "the chemical behavior of the elements is a periodic function of their atomic weights". At the present time the periodic table is built as a result of the electronic structure of the elements. The periodicity of the electronic configurations finds its origin in the periodic values of the quantic numbers n, 1, and m. Each new period starts up with a new main shell.

Although widely used, the present periodic chart consisting of 7 periods and 16 groups/sub-groups, shows serious defects from a didactic point of view. The are, mainly, the following:

1. The numbering of groups/sub - groups is inconsistant with the positions of the columns, from left to right of the table.

2. There is no general agreement on the designation of sub-groups A and B, neither on the numbering of the group of noble gases (eight or zero).

3. The insertion of transitional and inner transitional elements in the middle of the table, creates artificial empty spaces between neighboring elements Be and B, Mg and Al, Sc and Ti, Y and Zr. This has no scientific justification.

4. We can group the periods by pairs containing the same number x of elements. This number follows a simple law ($x=2\ p^2$ where p is an integer). ýIt is difficult to understand the exception of the first period: it is alone in its case although its contents follow the law.

*From USTHB University, 12 Baulevard Amirouche, BORDJ EL KIFFAN, Algiers, Algeria.

It is well- known, through many books, that some properties of the elements such as atomic sizes or ionization energies-change sharply at the end of each period. But these properties are generally linked to the main energy level. Their behaviour is the result of the way the table is built. They should not be used as a justification for choosing the end of each period after each noble gas.

If we compare, as we did, (2) many physical properties of the elements, such as the melting and boiling points, the densities, the heats of fusion and vaporization, the entropy, etc…, we also find a periodic variation with the atomic number Z. But, and this is striking, there is no justification for fixing the end of each period, as it has been done, just after the noble gases.

Through careful analysis of the curves describing the periodic properties, it appeared clearly that the best choice for ending each period should be and alkaline earth element.

Table 1.

rank (k)	filled shells and sub-shellls	number of elements in the period
1	1s	2
2	2s	2
3	2p 3s	8
4	3p 4s	8
5	3d 4p 5s	18
6	4d 5p 6s	18
7	4f 5d 6p 7s	32
8	5f 6d 7p 8s	...32

That means, in terms of atomic structure, that each period corresponds to the filling of shells and sub-shells according to n+1=k (k: constant) where n and 1 are the principal and azimutal quantic numbers. The constant k is the rank of the period.

The results are given in Table 1.

The number of periods is 8 instead of 7.

The blocks s, p, d and f are placed near one another, following this order from right to left. There is no more empty spaces between elements of the same period. As suggested by A. Areneo (3) after tests, it would be more rational to number the groups with reference to the blocks.

In this new chart, periods, can be grouped by pairs containing 2, 8, 18, 32, …, $2n^2$ elements, the integer n being the rank of the pair.

Because of their lightness, hydrogen and helium occupy places apart in the periodic table. Considering electronic structures, H and He belong to the block s. H is above alkaline elements. He is above alkaline earth elements. In as far as some chemical properties are concerned, we may move the 2 elements leftwards, putting H above halogens and He above noble gases.

A further detailed paper will be published soon.

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Correspondence:
Ramdane Ouahes
USTHB University,
12 Baulevard Amirouche,
BORDJ EL KIFFAN,
Algiers, ALGERIA.