EXPLANATION OF LONG FORM OF PERIODIC TABLE

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Abstract

The periodic table is constructed on the basis of increasing atomic number and repeating electronic configuration of the atoms. The structural features of the long form of periodic table has seven periods and eighteen groups. The types of elements are discussed here. The lanthanides and actinides are supposed to be in the main periodic table. But in the modern periodic table they are removed from the main table. The reason for the removal have been discussed. A table in which elements are arranged in an order of increasing atomic number in the manner that the elements with similar properties fall in the same vertical column is known as the periodic table (1). Various forms of periodic table have been put forth from time to time. We shall consider only the modern form known as the long form of the periodic table. The objective of the periodic table is to organize and systematize the chemistry of the elements. The long form periodic table also helps us to understand the reason why certain elements resemble one another and why they differ from other elements in their properties (1&2). Another significant feature of the long form periodic table is that it helps us to understand the cause of periodicity of properties and the reason why similar properties recur at certain regular intervals. The long form periodic table is given. The horizontal rows constitute periods while the vertical rows constitute groups.

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DIVISION OF ELEMENTS INTO s, p, d and f BLOCKS

The elements, as arranged in the long form periodic table, can also be divided into four blocks known as s, p, d and f blocks. This classification depends upon the type of the orbitals(s,p,d,f) into which the last electron of the atoms of the elements enters (1).

s Block Elements

The elements whose atoms receive the last electron in the s orbital of their outermost energy shell are called s block elements.

p Block Elements

The elements whose atoms receive the last electron in the p orbitals are called p block elements. The atoms of elements of Groups 13, 14, 15, 16, 17 and 18 having one, two, three, four, five and six electrons respectively in p orbitals.

d Block Elements

The elements in which the last electron enters the d orbitals of their last but one (penultimate) energy shells are called d block elements. General electronic configuration of d block elements is (n-1)d^{1-2} ns^{1-2}. These elements are called transition elements.
**f Block Elements**

The elements whose atoms receive the last electron enters the f orbitals of their atoms are called f block elements. It consist of two series of 14 elements each placed at the bottom of the periodic table. The first series follows lanthanum, La(Z=57) and the second series follows actinium, Ac(Z=89) in the order of increasing atomic numbers. These series are called lanthanides and actinides.

We know the elements are arranged in the increasing atomic number (1, 2).

On the basis of arranging the elements in the increasing order of this atomic number after the lanthanum (57), the 14 lanthanides should have been arranged. Then the titanium group element hofnium is placed after the elements lutetium (Z=71) of the 4f series. Hofnium is followed by Nb(Z=73), W(Z=74) etc which are third series of transition elements. Then the p- block elements thalium(Z=81), lead(Z=82) up to radon(Z=86). Similarly in the next period after the element Ac(Z=89), Th(Z=90) followed by remaining actinides. After the last element Lr(Z=103) of the 5f series, the newly synthesized Rf(Z=104) etc are in the 5d series which is incomplete as the remaining elements yet to be discovered. On this basis when we arrange the periodic table. The periodic table could be formed.

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This periodic table is very long which cannot be accommodated in a normal A4 size paper. Except the f block, all the other elements have vertical similarity.

But in lanthanides and actinides we find horizontal similarities. Thus the narrow bridged f- block elements are very much different from the rest of the elements. Therefore it is decided to remove the narrow bridged f- block from the proposed long-long form of periodic table. By doing so, the d- block elements form one block combining the first group of the transition series with rest of the transition element in the periodic table as s and p block.

Now it is clearly understood the reason for the separation of the f-block from the main periodic table. The 4f series elements which begin after the element lanthanum are brought down. Therefore the 14 elements after La(Z=57) are called lanthanides.

Similarly the 5f series elements after the element actinium are brought down and therefore they are called Actinides. There is no any other significance for the names lanthanides and actinides.

Since the original position for the lanthanides and actinides are in the sixth and seventh period, in the same period number sixth and seventh, are given for
the lanthanides and actinides instead of giving eighth and ninth period in the periodic table. We know that d-block elements are otherwise known as “transition elements”.

Thus the f-block elements which are in between d-block in the long-long form of the periodic table having similar properties to that of transition elements. However to distinguish them from the transition elements and also they are in between the transition elements, it is very much ideal to name them “inner transition elements”. Though in the long form of periodic table we give the lanthanides and actinides separately the real positions of these elements in the long-long form of periodic table in between the d-block elements should be emphasized among the students to understand the facts given above such as,

The reason for the removal of the f-block from the long-long form of periodic table

The reason for giving sixth and seventh period for lanthanides and actinides respectively.

The meaning of the term inner transition elements assigned for the lanthanides and actinides.

REFERENCE
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