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NOTE

Trinity of Hydrogen

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The position of hydrogen is not clear in the periodic table. This paper presents a new approach to solve this problem.

The periodic law was set forth by Mendeleev in 1869. The periodic law is expressed by the periodic system of the elements. As is known, mathematical functions can be expressed by tables. In case of the periodic law, a table was the most appropriate way. Hundreds of periodic systems have been proposed but only those that closely resemble the table worked out by Mendeleev have been widely adopted.

Position of Hydrogen in Short Form of Periodic Table

In all these classifications the position of hydrogen, the first element, is not clear. Hydrogen resembles both the alkali metals and the halogens. Hence, its position in the Periodic Table is undecided. Hydrogen can be placed in the I group as well as in VII group. Antropoff put hydrogen in IV group because it behaves as an unicovalent atom[1].

Thus, hydrogen can be placed in I group, IV group and VII group. But it is not justifiable to allot three places for a single element because hydrogen does not show equal degree of resemblance with alkali metals, carbon family as well as with the halogens. Hydrogen behaves more like alkali metals and halogens depending upon the conditions. Hydrogen shows less similarities with carbon family. So this situation can be explained only if hydrogen is in a periodic motion in the vacant first period of short form Periodic Table. Thus the periodic presence of hydrogen is possible in I group, IV group and VII group respectively[2].

Motion is said to be simple harmonic motion when it possesses the following characteristics:

(1) Motion is periodic
(2) Motion is to and fro along a straight line about the mean position.
(3) Acceleration is proportional to displacement.
(4) Acceleration is directed towards the mean positon.

The motion of hydrogen satisfies all the characteristics of simple harmonic motion in the following ways:

(1) Hydrogen can be detected in I group, IV group and VII group, after equal intervals of distance.

(2) IV Group is the mean position between I group and VII group. The IV group is the equilibrium position because it keeps equal distance with I group and VII group in short form periodic table[3]. In terms of energy, we can say that a particle undergoing harmonic motion (periodic motion) passes back and forth through a point (its equilibrium position) at which its potential energy is minimum[4]. In the same way hydrogen shows minimum resemblance with IV group.

(3) Hydrogen is moving to and fro along the first period about the IV group.

(4) Due to acceleration hydrogen cannot be detected in II group, III group, V group and VI group.

Evidences

(1) Hydrogen shows characteristics of s and p orbitals. So it can represent I, IV and VII group. The uniqueness of the first quantum shell resides in the peculiarity that while hydrogen and helium both belong to s orbitals they exhibit chemical properties typical of p orbitals[5].

(2) Due to simple harmonic motion of hydrogen, helium is pushed out to zero group from its original position in II group.

(3) The oscillating hydrogen fills the vacuum of the first period in short form periodic table.

(4) *Diagonal Relationship*: Elements of second short period show similarities with the corresponding elements of the next group of the third period.

TABLE-1

Group	I	II	III	IV
2nd period	Li	Be	B	C
3rd period	Na	Mg	Al	Si

This is known as diagonal relationship. Mendeleev could not assign any explanation for diagonal relationship.

By now it should not be difficult to understand why the diagonal relationship exists. It simply indicates the presence of a simple harmonic motion in first period. Due to the oscillation. hydrogen can represent every group and every element of second period can try to imitate its group leader, the hydrogen. But the elements of second group have no space for oscillation. So the characteristic of oscillation is reduced to diagonal relationship.

(5) *Cause of periodicity*[6]: This model shows the cause of periodicity in periodic table. As we know the displacement of a particle in periodic motion can always be expressed in terms of sines and cosines[4]

In the same way, the periodic motion of hydrogen can be expressed in terms of groups and periods because groups and periods are perpendicular to each other.

Thus oscillatory hydrogen creates a periodic behaviour in both the groups and the periods of periodic table.

In conclusion, hydrogen shows a periodic presence in the first period. The periodic motion of hydrogen in first period makes it possible to accommodate I group, IV group and VII group respectively. In other words, one hydrogen behaves in three different ways and this phenomenon should be termed, trinity.

Some of the anomalies in the Mendeleev's Periodic Table will disappear if the trinity of hydrogen in first period is considered.

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