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Whole and Part in Hydrogen Atom

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Abstract: *The thesis that part and whole have to be aligned has been discussed in the case of Hydrogen atom.*

Keywords: *Part and whole, Hydrogen atom, double surface geometry*

1. Introduction

The whole is made by parts only if the parts are aligned by the whole.

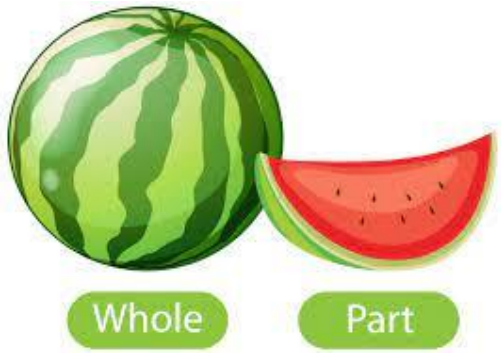

Figure1. *Whole and Part*

Let us check this thesis with the help of the double surface geometry in the case of Hydrogen atom.

2. The Hydrogen Atom as a Whole

Hydrogen atom is a whole made by the electron as its lighter part circling the proton on one of the orbits according to the restrictions of the double surface geometry [1]:

$$s(n) = n\left(2 - \frac{1}{\sqrt{1+\frac{\pi^2}{n^2}}}\right), \qquad n \in \mathbb{N}. \tag{1}$$

Where natural number n is the elliptic length and irrational number $s(n)$ is the average elliptic-hyperbolic length of some orbit expressed in Compton wavelengths of the electron. Respecting this concept - and allowing the diversity of kinetic and potential energy at the untouched total energy - the kinetic energy W_k of the electron in the ground state of Hydrogen atom is of the orbit n dependent in the interval $1 \leq n \leq 274$ as follows [1]:

$$W_k(n) = Ry\left(2\frac{s(137)}{s(n)} - 1\right) = Ry\left(\frac{137(2 - \frac{1}{\sqrt{1+\frac{\pi^2}{137^2}}})}{n(2 - \frac{1}{\sqrt{1+\frac{\pi^2}{n^2}}})} - 1\right), \quad 1 \leq n \leq 274, \quad n \in \mathbb{N}. \tag{2}$$

Where Ry denotes Rydberg constant.

On the 137th orbit the kinetic energy equals Rydberg constant:

$W_k(137) = Ry = 13.605\ 693\ 122\ 994\ eV.$ (3)

And on the longer orbit the kinetic energy is smaller, for instance on the 150th possesses the next value:

$W_k(150) = 0{,}826\ 746\ 231\ 537\ \text{Ry} = 11{,}248\ 455\ 516\ 887\ \text{eV}.$ (4)

3. Measuring the Part by the Whole

Mass m and Compton wavelength λ of the particle are in inverse proportion:

$\lambda = \frac{h}{mc}.$ (5)

So a lighter part $m_{part} < m_{whole}$ having longer Compton wavelength $\lambda_{part} > \lambda_{whole}$ can be measured by a heavier whole $m_{whole} > m_{part}$ having shorter Compton wavelength $\lambda_{whole} < \lambda_{part}$ expressed by the ratio:

$R = \frac{\lambda_{Part}}{\lambda_{Whole}} = \frac{m_{Whole}}{m_{Part}} > 1.$ (6)

4. Measuring the Electron Wavelength by the Hydrogen Atom Wavelength

In our case we have:

$m_{whole} = m_{proton} + m_{electron}.$

$m_{part} = m_{electron}.$ (7)

Taking into account the rest proton/mass ratio $\frac{m_{proton}}{m_{electron}} = 1836.152\ 673\ 43$ the next part/whole wavelength ratio is given:

$R = \frac{\lambda_{part}}{\lambda_{whole}} = \frac{m_{proton} + m_{electron}}{m_{electron}} = \frac{m_{proton}}{m_{electron}} + 1 = 1836.152\ 673\ 43 + 1 = 1837.152\ 673\ 43.$ (8)

The above ratio is not a natural number as long as it counts the number of Compton wavelengths of the atom $\lambda_{proton+electron}$ laid only on the wavelength of the electron $\lambda_{electron}$ in the elliptic space. When the measurement is carried out equally in the hyperbolic space, too, the unit value of Compton wavelength of the electron $n = 1$ is modified to $s(1)$) being calculated with the help of the equation (1) as follows:

$s(1) = 1\left(2 - \frac{1}{\sqrt{1 + \frac{\pi^2}{1^2}}}\right) = 1{,}696\ 685\ 528\ 947\ \ldots$ (9)

Taking into account the above correction the next modified part/whole wavelength ratio (8) is given:

$R_{modified} = 1837.152\ 673\ 43\ \text{x}\ 1{,}696\ 685\ 528\ 947 = 3.117{,}070\ 355\ 572\ 344\ \ldots$ (10)

The modified ratio $R_{modified}$ (10) almost equals the natural number $n = 3117$. Actually, respecting the elliptic-hyperbolic characteristics of the length meter, too, we expect to get the irrational number very close to it:

$s(3117) = 3117{,}001\ 583\ 188\ 460.$ (11)

To meet expectations the mass equivalent of the kinetic energy of the electron should be taken into account.

5. Taking into Account the Kinetic Energy of the Electron

Let us write the modified part/whole ratio for Hydrogen atom again including the influence of kinetic energy W_k of the electron:

$R_{modified} = \left(\frac{m_{proton}}{x.\, m_{electron}} + 1\right) x\ s(1)$

$x = \frac{m_e + W_k/c^2}{m_e} = 1 + \frac{W_k/c^2}{m_e}.$ (12)

Where $m_e = 510\,998{,}950\ eV/c^2$ denotes the rest mass of the electron and W_k denotes the kinetic energy of the electron in the ground state of Hydrogen atom:

$$W_k = \left(\frac{\frac{m_{proton}}{m_{electron}}}{\frac{s(3117)}{s(1)} - 1} - 1 \right) m_e c^2. \tag{13}$$

Applying the data (8), (9), (11), (12) we have:

$$W_k = \left(\frac{1836.152\ 673\ 43}{\frac{3117{,}001\ 583\ 188\ 460}{1{,}696\ 685\ 528\ 947} - 1} - 1 \right) 510\ 998{,}950\ eV = 11{,}280\ 618\ 543\ 795\ eV. \tag{14}$$

This value on the first decimal equals the kinetic energy on the 150th orbit in the ground state of Hydrogen atom (4) as follows:

$$W_k(150) = 11{,}25 \approx W_k = 11{,}28\ eV. \tag{15}$$

6. Conclusion

The thesis that the whole is made by parts only if the parts are aligned by the whole is confirmed with the help of the double surface geometry in the case of Hydrogen atom.

Dedication

This fragment is dedicated to Dvorec Dornava (Dornava mansion), Podravje, Slovenija (Slovenia) to shield the new Pharmacy Springer in Dornava with beauty.

Figure2. D*vorec Dornava (Dornava mansion)*

References

[1] Janez Špringer. How Far Away and Often from Bohr Orbit (Treatise on the Choice). International Journal of Advanced Research in Physical Science (IJARPS). Volume 3, Issue 9, 2016, PP 1-6

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