Report on the Evaluation
of Chapter 10
in
"The Grand Unified Theory of Classical Physics"
by Dr. Randell L. Mills

Prepared by

Randy A. Booker, Ph.D.
57 Azalea Drive
Weaverville, NC 28787
(828) 251-6269
Booker@unca.edu

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Executive Summary

In my analysis, I verified calculations and equations involving 3-electron atoms, 12-electron atoms, and 20-electron atoms found in Chapter 10 of the book "The Grand Unified Theory of Classical Physics" by Dr. Randell L. Mills. I verified all of the values in Table 10.1, 10.11, and 10.20 to a high degree of accuracy.
There is a remarkable agreement between the CP calculated values for the ionization energies and the experimental ionization energies for these three cases of multi-electron atoms. Every single value in Tables 10.1, 10.11 and 10.20 was found to be true and accurate based on the CP theory.

Purpose

In Chapter 10, all atoms from 3-electron atoms to 20-electron atoms can be solved exactly in closed form solutions, unlike traditional quantum mechanics which must resort to approximation methods. In the traditional approach, approximation methods using the Schrodinger equation must be used since these are n-body problems. And n-body problems cannot be solved by the use of closed-form solutions. They must be solved by approximation methods using combinations of 2-body interactions.

This chapter discusses 18 multi-electron systems, from 3-electron atoms, to 4-electron atoms, to 5-electron atoms, all the way up to 20-electron atoms. Since this chapter is longer than other chapters in the CP book (115 pages compared to an average chapter length of 23 pages), I decided to focus my analysis on just three of the multi-electron systems discussed in this chapter: the 3-electron atoms, the 12-electron atoms, and the 20-electron atoms. Even the verification of just these three atomic systems proved to be time intensive, but worth it since the CP results were completely verified in the process of my analysis.

The radius of electron 3 is found by balancing forces: namely the outward centrifugal force on electron 3 is balanced by the electric force and the diamagnetic forces. Next the ionization energy of Lithium is calculated and it is shown to agree very closely to the experimentally-known ionization energy of Lithium. After this, 3-electron atoms with a nuclear charge of $Z > 3$ are analyzed. CP theory says that there is an additional diamagnetic force that repels the third, or outer, electron, plus an electric force that attracts the third electron. The radius of the third (outer) electron, r_3, is solved by equating the outward centrifugal force to the sum of the electric and the two diamagnetic forces. This results in a quadratic equation for r_3. The solution for r_3 involves applying the quadratic formula to find the solution of this quadratic equation. Once r_3 is known, then the ionization energies of 3-electron atoms having a nuclear charge of $Z > 3$ are found simply and straightforwardly. However, relativistic corrections to r_1 (the radius of the orbitsphere of the two inner electrons) and to r_3 must be used, adding to the complexity of the calculation. The results of r_1, r_3, electric energy, change in the kinetic energy of the inner electrons, theoretical ionization energy, experimental ionization energy, and relative error between the two ionization energies are given in Table 10.1 for 3-electron atoms with Z values ranging from Z=3 to Z=29.

The agreement in Table 10.1 between the CP theoretical ionization energies and the experimental ionization energies is nothing short of amazing. This is one of the great successes of CP: that it predicts the ionization energies of 3-electron up through 20-electron atoms and gets them right.

Next, I analyzed 12-electron atoms. Again the outward centrifugal force on electron 12 is balanced by the electric force and the magnetic forces on electron 12. The radius of the outer electron (electron 12) is calculated by equating the outward centrifugal force with the sum of the electric force, two diamagnetic forces, and two paramagnetic forces. Once r_{12} has been calculated, the ionization energy is easily found. After this, 12-electron atoms with a nuclear charge of Z > 12 are analyzed. CP theory calculates the radius of the outer electron (electron 12) by setting the outward centrifugal force equal to the sum of electric, diamagnetic, and paramagnetic forces. This again results in a quadratic equation for r_{12}, which is easily solved by the use of the quadratic formula. This seems to be a common theme in Chapter 10, that to solve for the radius of the outer electron in the 3-electron to 20-electron systems, all that is required is the solution of a quadratic equation. No approximation methods are needed, and the answer comes out in a closed-form solution using only algebra. Once r_{12} is determined, then the ionization energies of the 12-electron atoms are easily found. The results of r_1, r_3, r_{10}, r_{12}, theoretical ionization energy, experimental ionization energy, and relative error between the two ionization energies are given in Table 10.11 for 12-electron atoms with Z values ranging from Z=12 to Z=30.

My values are in excellent agreement with all the values listed in Table 10.11. Dr. Mill's calculations are once again in exceptional agreement with the known experimental ionization energies for 12-electron atoms – a truly remarkable accomplishment.

Next, I analyzed 20-electron atoms. Again the outward centrifugal force on electron 20 is balanced by the electric force and the magnetic forces on electron 20. The radius of the outer electron (electron 20) is calculated by equating the outward centrifugal force with the sum of the electric force, diamagnetic forces, and paramagnetic force. Once r_{20} has been calculated, the ionization energy is easily found. After this, 20-electron atoms with a nuclear charge of Z > 20 are analyzed. CP theory calculates the radius of the outer electron (electron 20) by setting the outward centrifugal force equal to the sum of electric, three diamagnetic, and one paramagnetic force. This again results in a quadratic equation for r_{20}, which is easily solved by the use of the quadratic formula. (Again this seems to be a common theme in Chapter 10, that to solve for the radius of the outer electron in the 3-electron to 20-electron systems, all that is required is the solution of a quadratic equation.) Once r_{20} is determined, then the ionization energies of the 20-electron atoms are easily found. The results of r_1, r_3, r_{10}, r_{12}, r_{18}, r_{20}, theoretical ionization energy, experimental ionization energy, and relative error between the two ionization energies are given in Table 10.20 for 20-electron atoms with Z values ranging from Z=20 to Z=30.

My values are in excellent agreement with all the values listed in Table 10.20. And Dr. Mill's calculations are once again in remarkable agreement with the known experimental ionization energies for 20-electron atoms.

Calculation

3-Electron Atoms

I have verified that Equations 10.1, 10.3, 10.4, 10.5, and 10.7 – 10.12 are true.

I have verified the equations and the values listed in Equations 10.13 and 10.14. I have verified that Equations 10.15 - 10.21 all check out to be correct.

I get the same values and equations as the CP book for Equations 10.22 - 10.25.

I have verified Equations 10.26, 10.28, 10.30, 10.31, 10.32, 10.33, 10.34, and 10.35 as being correct as stated in the CP book.

I have verified all the equations from 10.37-10.47, including the quadratic equation and its solution using the quadratic formula. I find them all to be correct.

I carefully checked every value in Table 10.1 and find them all to be correct as stated.

12-Electron Atoms

I have verified that Equations 10.237 and 10.239 – 10.245 are in fact correct.

I get the same values as the CP book for Equations 10.246 and 10.247.

I have verified all of the equations from 10.248-10.255, including the quadratic equation and its solution by the quadratic formula to yield r_{12} in Equation 10.255.

I carefully checked every value in Table 10.11 and find them all to be correct as stated.

20-Electron Atoms

I have verified that Equations 10.427 - 10.435 are correct.

I get the same values as the CP book for Equations 10.436 and 10.437.

I have verified all of the equations from 10.438 – 10.445, including the quadratic equation and its solution by the quadratic formula to yield r_{20} in Equation 10.445.

I carefully checked every value in Table 10.20 and find them all to be correct as stated.

Conclusion

I was able to verify the CP results of Chapter 10 in excellent agreement with my own calculations. I verified all of the values listed in Tables 10.1, 10.11, and 10.20 to a very high degree of accuracy. There is an exceptional agreement between the CP calculated values for the ionization energies and the experimental values for these ionization energies for these three tables.

I find my results and calculations to be confirmation that the calculations of Chapter 10 and the values listed in Tables 10.1, 10.11, and 10.20 are indeed accurate, valid, and reproducible.