Report on the Evaluation of Revised Chapter 11 The Nature of the Chemical Bond Of Hydrogen-Type Molecules and Molecular Ions 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

July 30, 2018

Executive Summary

In my analysis, I verified calculations and equations involving Hydrogen-Type Molecular Ions, Hydrogen-Type Molecules, the Hydrogen Molecular Ion, the Hydrogen Molecule, the Dihydrino Molecular Ion, and the Dihydrino Molecule found in Revised Chapter 11, The Nature of the Chemical Bond of Hydrogen-Type Molecules and Molecular Ions, of the book "The Grand Unified Theory of Classical Quantum Physics" by Dr. Randell L. Mills. I verified all of the values in Table 11.1, Figure 11.5, and Figure 11.6 to a high degree of accuracy.
There is a remarkable agreement between the CP calculated values for the energies and distances of these molecular systems with experimental values of those corresponding quantities. Every single calculated value in Table 1 of Chapter 11 was found to be true and accurate based on the CP theory.

Purpose

In Chapter 11, the Classical Physics theory is applied to predict results pertaining to hydrogen molecular ions and hydrogen molecules. Before doing this, the general theory for any hydrogen-type molecule or hydrogen-type molecular ion is developed first. Next, applications to dihydrino molecular ions and dihydrino molecules are presented. The chapter gives a summary of the major geometrical results in Figure 11.5, and compares them to results for atoms in Figure 11.4. Lastly, equations and values of nuclear magnetic resonance shifts for these molecular systems are presented.

When two hydrogen atoms interact, they can form a hydrogen molecule H_2. Also, removing an electron from the hydrogen molecule creates a molecular hydrogen ion H_2^+. Hydrino atoms were discussed earlier in the CP book and their existence has been documented in the literature. Hydrino atoms are formed when hydrogen interacts with a catalyst, such as Helium or Strontium, thus carrying away excess energy from the hydrogen and causing the hydrogen to go into a state with lower energy than its ground state. This "lower than ground state energy" system is called a hydrino. When two hydrino atoms interact, they can form a dihydrino molecule. It's well known that when a single electron is removed from H_2, then a hydrogen molecular ion is formed. Similarly, when an electron is removed from a dihydrino molecule, then a dihydrino molecular ion is formed. These four molecular systems (hydrogen molecule, hydrogen molecular ion, dihydrino molecule, and dihydrino molecular ion) form the subject of Chapter 11.

Initially, the hydrogen-type molecular ion system is discussed in general. Equations of motion are written down and solved for this system. General equations for the radius, eccentricity, and energy are derived. Circular, elliptical, parabolic, and hyperbolic

solutions are seen to exist, in general. Next the equation for an ellipsoidal molecular orbital (MO) is derived, as well as the Laplacian for the ellipsoidal MO. Next the potential and the distribution of charge over the conducting surface are derived. Then the electric force equation and the centrifugal force equation are derived. These two forces are then balanced, which results in an expression for the semimajor axis of the molecular system. Expressions for the kinetic energy T and the potential energy V_e of the electron MO are derived, as well as expressions for the semiminor axis b, the internuclear distance 2c' between the two foci, and the eccentricity. An expression for the total energy E_T is also produced.

Next comes the important discussion of vibration in hydrogen-type molecular ions. Expressions for ω and the amplitude of the oscillation A are derived. Expressions for the spring constant k and the energy of vibration E_{vib} are derived as well. An expression for an anharmonic perturbation is derived, which is used to describe higher vibrational states. A similar discussion is done for deuterium-type molecular ions and equations for ω, E_{vib}, k, A, and the anharmonic term are also derived.

A Doppler energy term is derived next and is used to produce an expression for the energy of oscillation E_{osc}. Next the total ionization energy and the bond energy of the hydrogen and deuterium molecular ions is discussed, with appropriate expressions being derived.

Next, the discussion shifts away from molecular ions to hydrogen-type molecules. The force balance equation is written down, which leads to expressions for the semimajor axis, the semiminor axis, the internuclear separation, and the eccentricity. Next, expressions for the energies V_e, V_p, T, E_T, and the magnetic energy V_m are derived. Again, vibration is discussed, this time as it applies to the hydrogen-type molecular system. Equations for ω, E_{vib}, k, A, and the anharmonic term are derived. A similar discussion is done for deuterium-type molecules and equations for ω, E_{vib}, k, A, and the anharmonic term are derived. A Doppler energy term is derived next and is used to produce an expression for the energy of oscillation E_{osc}. Next the total ionization energy and the bond energy of the hydrogen and deuterium molecular systems are discussed, with appropriate expressions being derived.

Next, these general equations are applied to the important case of the Hydrogen Molecular Ion. The force balance equation is written down, which leads to expressions for the semimajor axis, the semiminor axis, the internuclear separation, and the eccentricity. Next, expressions for the energies V_e, V_p, T, and E_T, are derived. Values for the bond energies of the hydrogen molecular ion and the deuterium molecular ion are produced and compared to experimental values. There is good agreement between the two sets of values with the experimental results. Again, vibration is discussed, this time as it applies to the hydrogen-type molecular ion system. Equations and values for ω, E_{vib}, k, A, and the anharmonic term are derived. A comparison of E_{vib} and the anharmonic term to experimental values for H_2^+ is made and the agreement is very good. A comparison of E_{vib} to its experimental value for D_2^+ is made and the agreement here is also very good.

Next, these general equations are applied to the important case of the Hydrogen Molecule. The force balance equation is written down, which leads to expressions for the semimajor axis, the semiminor axis, the internuclear separation, and the eccentricity. Next, expressions for the energies V_e, V_p, V_m, T, and E_T, are derived. Values for the bond energies of the hydrogen molecular ion and the deuterium molecular ion are produced and compared to experimental values. There is good agreement between the two sets of values with the experimental results. Again, vibration is discussed, this time as it applies to the hydrogen-type molecular system. Equations and values for ω, E_{vib}, k, A, and the anharmonic term are derived. A comparison of the bond dissociation energies of H_2 and D_2 to experimental values is made and the agreement here is excellent. A comparison of E_{vib} and the anharmonic term to its experimental value for H_2 is made and the agreement here is very good. There's also an excellent agreement between E_{vib} and its experimental value for D_2 and a good agreement between the anharmonic term for D_2 and its experimental value.

A summary of the Calculated and Experimental values for H_2, D_2, H_2^+, and D_2^+ are given in Table 1 of Revised Chapter 11. Here the agreement between the calculated and experimental values is remarkable. There is certainly seen an excellent agreement between the values derived from the CP theory and the experimental values. This is vindication that the CP theory works for these molecular systems.

Next, the general equations from the first part of the chapter are applied to the case of the Dihydrino Molecular Ion. The force balance equation is written down, which leads to expressions for the semimajor axis, the semiminor axis, the internuclear separation, and the eccentricity. Next, expressions for the energies V_e, V_p, T, and E_T, are derived. Equations and values for ω, E_{vib}, k, and A are also derived.

Next, the general equations from the first part of the chapter are applied to the case of the Dihydrino Molecule. The force balance equation is written down, which leads to expressions for the semimajor axis, the semiminor axis, the internuclear separation, and the eccentricity. Next, expressions for the energies V_e, V_p, V_m, T, and E_T, are derived. Equations and values for ω, E_{vib}, k, and A are also derived.

Next, the chapter gives a summary of the major geometrical results of the four molecular systems in Figure 11.5, and compares them to results for atoms in Figure 11.4. Next, the ortho-para transition frequency for hydrogen-type molecules is derived. Then there is presented a discussion of the nuclear magnetic resonance shift for these molecular systems. This yields an expression for the absolute upfield chemical shift. There is a relativistic correction to this upfield chemical shift which is discussed, which yields a slightly modified expression. The upfield chemical shift value is shown to be in excellent agreement with the one from experiments.

Calculation

I have verified that Equations 11.5 – 11.14 are true.

I have verified that Equations 11.16 – 11.22 are also correct.

I have verified that Equations 11.24, 11.25, 11.26, 11.28, 11.30, and 11.31 are indeed correct.

I have verified that Equations 11.33 – 11.37 all check out to be correct.

I have also verified that Equations 11.40, 11.42, 11.45, 11.47 – 11.50, 11.52, and 11.53 are also valid and correct.

I have verified that Equations 11.54 – 11.57 and 11.61 – 11.64 are correct.

I have verified Equations 11.65 – 11.70 and 11.72 – 11.76 as being correct as stated in the CP book.

And I have verified that Equations 11.78-11.81 and 11.83 – 11.84 are indeed correct.

Likewise, Equations 11.88, 11.89, 11.91 – 11.95, 11.99, 11.100, and 11.102 are correct.

I have verified that Equations 11.104 – 11.115, 11.118, and 11.120 – 11.124 are valid. Equation 11.125 is correct, as is the value listed in Equation 11.125.

I have verified that Equations 11.127 – 11.136 are correct.

I have verified as correct all of the Equations 11.137-11.144. I have also verified that the equation and the value listed in Equation 11.145 are correct.

I have verified as correct all Equations 11.146-11.152, 11.154, 11.155, and 11.158-162.

I have verified as correct Equations 11.163-11.166 and the values they contain.

I have verified as correct Equations 11.169, 11.170, and 11.172.

I have verified as correct Equations 11.173-11.175 and the values they contain.

I verified that Equations 11.176, 11.177, 11.179, and 11.180 are correct.

I have verified that Equations 11.182 – 11.184 are valid.

I have verified as correct Equations 11.185-11.187 and the values they contain.

I have verified as correct Equations 11.189, 11.190, 11.192, and 11.193 and the values they contain. I have also verified as correct Equations 11.188, 11.191, and 11.195.

I have verified as correct Equations 11.198-11.199 and the values they contain.

I have verified as correct Equations 11.203-11.209.

Likewise, Equations 11.211 and 11.212 and its value are correct.

I have verified all the equations Equation 11.215, 11.216, 11.218-11.224, and 11.230.

I have verified that the values in Equations 11.226-11.229 are correct and are valid.

I have verified that the values and equations in Equations 11.233-11.235 are correct and are valid, as well as Equation 11.236.

I have verified that the values and equations in Equations 11.237-11.238 are correct and are valid, as well as Equation 11.239.

I have verified that the values in Equations 11.240-11.242 are correct and are valid, as well as Equation 11.243.

I have verified that the values and equations in Equations 11.244-11.245 are correct and are valid, as well as Equation 11.246.

I have verified that the values and equations in Equations 11.247-11.248 and 11.252-11.253 are correct and are valid, as well as Equation 11.249.

I have verified that the Equations 11.254-11.261 are correct and are valid.

I have verified that the values and equations in Equations 11.262-11.267 are correct and are valid.

I have verified that the values in Equations 11.268, 11.269, 11.271, 11.273-277, 11.279, 11.281, and 11.283 are correct and are valid.

I have verified that the Equations 11.285-11.289 are correct and are valid.

I have verified that the values and equations in Equations 11.290-11.300 are correct and are valid.

I have verified that the values in Equations 11.302 and 11.304-11.308 are correct and are valid.

I have verified that the values in Equations 11.310, 11.312, and 11.314 are correct and are valid.

I carefully checked every value in Table 1 of Revised Chapter 11. All my values are in exact agreement with Dr. Mill's values in the Calculated column. I was also able to verify as correct most of the Experimental values listed in Table 1 from the footnotes at the end of Table 1 and from the chapter.

I have verified that Equations 11.317-11.322 are in fact correct.

I have verified all the equations and values from Equation 11.324-11.333 are correct.

All the Equations 11.334-11.338 are correct.

I have also verified as correct all the equations and values from Equations 11.339-11.349.

I have also verified as correct all the equations and values from Equations 11.352-11.359.

I verified as correct the sizes of the atomic systems listed in Figure 11.5.

I verified as correct the values for the Hydrogen Molecular Ion, Hydrogen Molecule, Dihydrino Molecular Ion, and Dihydrino Molecule listed in Figure 11.6.

I have verified as correct Equations 11.362 and 11.364. I also verified the $\Delta H_{2(1/4)}$ calculation after Equation 11.365, plus Equation 11.367.

I have verified that the calculation of magnetic flux after Equation 11.367 is correct.

I have verified that Equations 11.368-11.370, 11.372-11.373, and 11.375-388 are correct.

I have verified that Equations 11.390-400, 11.404, 11.406, and 11.408-11.410 are correct.

Lastly, Equations 11.411 and its value, and the Equations 11.414, and 11.415 have been shown to be correct.

<u>I have found a few typos that should be corrected in Chapter 11 of CP:</u>

All typos have been corrected in the Revised version of Chapter 11. No typos were found.

Conclusion

I was able to verify the CP results of Revised Chapter 11 in excellent agreement with my own calculations. I verified all of the calculated values listed in Table 1 to a very high degree of accuracy. I successfully reproduced almost all of the 416 equations and their corresponding values found in Chapter 11. There was also excellent agreement between many of the calculated results based on the CP theory and their corresponding experimental values. There is quite a remarkable agreement between the two. And it shows that the CP theory is successful in not only describing atomic systems as it did in Chapters 1-10, but it is also successful at describing hydrogen-type molecular systems as well (and to a high degree of accuracy).

I find my results and calculations to be confirmation that the calculations and equations of Chapter 11, and the values listed in Table 1 and Figure 11.5 and 11.6, are indeed accurate, valid, and reproducible.