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The Classical Atom (Rev. 1.0)

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0. Introduction

The purpose of this paper is to use classical, Newton's and Coulomb's theories to describe the atom and thereby eliminate the need for a unification theory that has to-date been considered necessary to unite both sub-atomic and super-atomic systems.

*(Refer to **Appendix 1** for an explanation of the papers, mathematical formulas, constants, symbols and units used in this document)*

1. Conclusions

This paper appears to show that the elliptical shape predicted by classical theory does not apply to electrons in an atom and therefore disqualifies it for such calculations.

Every part of every atom (from Z = 1 to Z = 92) has been fully analysed and explained using Newton's and Coulomb's laws during the generation of this paper.

1.1 Further Work

Calculate the behaviour of electrons in atoms using Newton's '*laws of motion*' and Coulomb's law for electrostatic force.

2. The Body System

Any atom.

3. Methodology

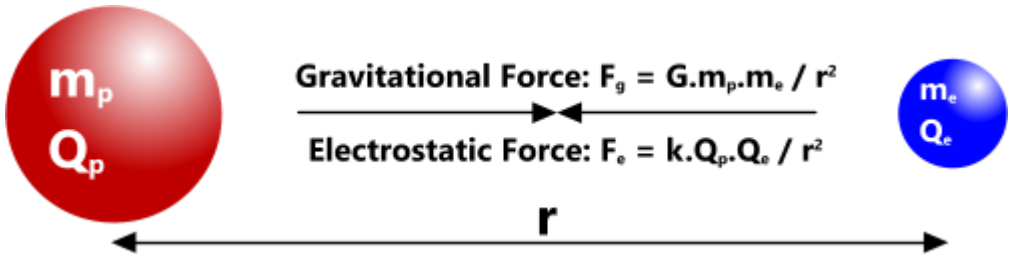
Devise a simple mathematical procedure using classical theory conjointly with Newton's and Coulomb's laws for force attraction to describe the behaviour of electrons in an atom for all atomic and shell numbers.

The successful procedure must show it is possible to begin the calculation procedure with any shell and atomic number working though all motion, force and energy characteristics and return to the same shell and atomic numbers.

4. Calculations

4.1 Repulsion and Attraction Forces

Protons and electrons provide electrical; repulsion forces between themselves and attraction forces between each other.



The above Fig shows the ratio of attraction between Newton's gravitational force and Coulomb's electrostatic force, the constant for which is: F_g / F_e = -4.40742111792335E-40 (Table 9)

4.2 Calculations Procedure

All calculation formulas are provided in the Tables of Results in sub-section 4.4

4.3 Findings

The calculations in this paper are based upon classical theory developed by Johannes Robert Rydberg, Charles-Augustin de Coulomb and Isaac Newton.

They reveal a working model of the atom that is currently regarded as an accurate description of the behaviour of the sub-atomic particles in any atom.

The results listed in Sub-Section 4.2 (below) provide the properties and characteristics of the electrons in the first five shells according to these theories. In reaching these results, all the associated properties for the first 92 elements in the periodic Table were calculated and the results found to be consistent.

However, there are a number of issues with the calculation results:

1) They assume that an electron's (and a proton's) electrostatic angular moment apply at the same centre as its mass, which is unlikely
2) The resultant eccentricity of 1.0 (parabola) is incompatible with the electron orbital shape
3) If the eccentricities are indeed ellipses, they can only apply to electrons at their perigee
4) If the calculated eccentricities are correct, according to elliptical theory ($b = a.\sqrt{[1 - e^2]}$) the apogee radii reduce with shell number ultimately becoming smaller than the perigee radius of shell 1 (e.g. Shell 6: 2.58899E-11)
5) It is clear from Coulomb's law (and Dalton's law) that electrons will distance themselves equally throughout an atomic structure, which can only be achieved with circular orbits

Whilst the [classical theory] calculations in their current form may appear valid for an electron at its perigee, it is necessary to apply Newton's laws of motion for the rest of the orbit. But Newton's laws of motion show the electron orbit to be circular (Appendix 1) as is expected from electron-microscope photographs.

It is therefore the conclusion of this paper that, with the exception of electron and proton separation (Tables 7a & 7b) Newton's '*laws of motion*' must apply to electron behaviour in an atom (further work).

4.4 Tables of Results

The following Tables include the [classical] calculation results for shells 1 to 5:

Shell	Kinetic Energy	Shell Radius	Shell Area	Shell Volume
Formulas	$R_\infty.h.c.(Z/n)^2$	$a_o.n^2/Z$ $R_{n-1} + a_o.(2.n - 1)$	$4\,\pi.R^2$	$^4/_3\,\pi.R^3$
Units	J	m	m^2	m^3
n	R_γ	R	A	V
1	2.17987197684936E-18	5.291772106700E-11	3.51894216858592E-20	6.207146670938E-31
2	5.44967994212340E-19	2.116708842680E-10	5.63030746973747E-19	3.972573869400E-29
3	2.42207997427707E-19	4.762594896030E-10	2.85034315655460E-18	4.525009923114E-28
4	1.36241998553085E-19	8.466835370720E-10	9.00849195157996E-18	2.542447276416E-27
5	8.71948790739744E-20	1.322943026675E-09	2.19933885536620E-17	9.698666673340E-27

Table 1: Shell Size

Shell	Semi-Major Axis	Eccentricity	Half Parameter	Shell Number	Shell Capacity
Formulas	R / (1-e) (1)	(-R + √[R² - 4.a.{R-a}]) / 2.a where: $a = \sqrt[3]{[G.m_p / (2\pi/t)^2]}$	$a.(1-e)^2$	R / 3.d √[R / R₁] √[t / n.t₁]	$2.n^3$
Units	m				
n	a	e	C	N	p
1	2.6462441580938E-11	-0.999729348675	1.43222513204E-14	1	2
2	1.0584976632375E-10	-0.999729348675	5.72890052825E-14	2	8
3	2.3814074108147E-10	-0.999907648898	4.39830888227E-14	3	18
4	4.2339906529500E-10	-0.999729348675	2.29156021121E-13	4	32
5	6.6136997935644E-10	-1.000307041397	0	5	50

Table 2: Shell Shape

This table is the only part of the classical calculation sequence that remains unconvincing as it shows a parabolic orbital shape (eccentricity = 1), which has only one focus centre and is therefore impossible.
Refer to Newton's Atom for a solution.
1) focus distance f = R in this Table

Shell	Wave Length	Frequency	Linear Momentum	Linear Velocity	Period	Angular Velocity	Angular Momentum
Formulas	2π.R / n	v/ λ	$m_e.v$	√[2.R_γ / m_e] $v = v_1 / n$	2π.R / v $t_1 . n^3$	2π / t	$^2/_5.\ m_e.R^2$
Units	m	Hz	kg.m/s	m/s	s	$^c/s$	$kg.m^2$
n	λ	*f*	p	v	t	ω	J
1	3.324918E-10	6.579681E+15	1.992852E-24	2.187690E+06	1.519830E-16	4.134136E+16	1.020356E-51
2	6.649837E-10	1.644920E+15	9.964262E-25	1.093845E+06	1.215864E-15	5.167670E+15	1.632569E-50
3	9.974755E-10	7.310757E+14	6.642841E-25	7.292301E+05	4.103542E-15	1.531161E+15	8.264880E-50
4	1.329967E-09	4.112301E+14	4.982131E-25	5.469226E+05	9.726915E-15	6.459587E+14	2.612110E-49
5	1.662459E-09	2.631872E+14	3.985705E-25	4.375381E+05	1.899788E-14	3.307308E+14	6.377222E-49

Table 3: Electron Velocities

Shell	Electrostatic	Magnetic	Gravitational (acceleration)
Formulas	$k.Q_p / R^2$	$\mu_0.Q_p / 2\pi R$	$G.m_p / R^2$
Units			m/s^2
n	E	B	g
1	5.142206313558E+11	6.055349532159E-16	3.986163589659E-17
2	3.213878945974E+10	1.513837383040E-16	2.491352243537E-18
3	6.348402856245E+09	6.728166146844E-17	4.921189616863E-19
4	2.008674341234E+09	3.784593457600E-17	1.557095152211E-19
5	8.227530101693E+08	2.422139812864E-17	6.377861743455E-20

Table 4: Proton Fields

Shell	Electrostatic	Magnetic	Gravitational	Centrifugal
Formulas	$k.Q_e.Q_p / R^2$	$Q_p.(E + B.v)$	$G.m_e.m_p / R^2$	$m_e.v^2 / R$
Units	N	N	N	N
n	F_e	F_m	F_g	F_c
1	-8.23872204961127E-08	-1.31819552793780E-10	-3.63115175461575E-47	-8.23872204961127E-08
2	-5.14920128100705E-09	-5.14920128100705E-09	-2.26946984663484E-48	-5.14920128100705E-09
3	-1.01712617896435E-09	-1.01712617896435E-09	-4.48290340076018E-49	-1.01712617896435E-09
4	-3.21825080062940E-10	-3.21825080062940E-10	-1.41841865414678E-49	-3.21825080062940E-10
5	-1.31819552793780E-10	-1.31819552793780E-10	-5.80984280738519E-50	-1.31819552793780E-10

Table 5: Potential (attraction) Forces

Shell	Kinetic	Electrostatic	Magnetic	Gravitational	Centrifugal	Total
Formulas	$½m.v^2 + ½J.\omega^2$	$F_e.R$	$F_m.R$	$F_g.R$	$F_c.R$	$KE+PE_e$
Units	J	J	J	J	J	J
n	KE	PE_e	PE_m	PE_g	PE_c	E
1	3.0518208E-18	-4.3597440E-18	-4.3597440E-18	-1.9215228E-57	-4.3597440E-18	-1.3079232E-18
2	7.6295519E-19	-1.0899360E-18	-1.0899360E-18	-4.8038069E-58	-1.0899360E-18	-3.2698080E-19
3	3.3909120E-19	-4.8441599E-19	-4.8441599E-19	-2.1350253E-58	-4.8441599E-19	-1.4532480E-19
4	1.9073880E-19	-2.7248400E-19	-2.7248400E-19	-1.2009517E-58	-2.7248400E-19	-8.1745199E-20
5	1.2207283E-19	-1.7438976E-19	-1.7438976E-19	-7.6860910E-59	-1.7438976E-19	-5.2316927E-20

Table 6: Energies

Shell	Electron Separation Distance	Nucleus Repulsion Energy	Electron Repulsion Force
Formulas	V / A	$k.Z^2.Q_e.Q_p / 2.R$	$k.Q_e.Q_p / d^2$
Units	m	J	N
n	d	E_S	F_S
1	1.763924035567E-11	2.179871976849E-18	7.41484984465015E-07
2	3.527848071133E-11	4.904711947911E-18	1.85371246116254E-07
3	5.291772106700E-11	2.930716768875E-17	8.23872204961127E-08
4	7.055696142267E-11	1.145795207831E-16	4.63428115290634E-08
5	8.819620177833E-11	3.244521450343E-16	2.96593993786006E-08

Table 7a: Electron Separation

Shell	Separation Between Shells	Electron Separation	Shell Number	Atomic Number
Formulas	$R_n - R_{n-1}$	E_S / F_S	$\sqrt{[PE_{e1} / PE_e]}$	$\sqrt{[\ell / \ell_1]}$
Units	m	m		
n	δ	ℓ		Z
1	5.29177210670E-11	2.93987339261111E-12	1	1
2	1.58753163201E-10	2.64588605335E-11	2	3
3	2.64588605335E-10	3.55724680505945E-10	3	11
4	3.70424047469E-10	2.47243352318594E-09	4	29
5	4.76259489603E-10	1.09392688939059E-08	5	61

Table 7b: Electron Separation

Note: Z applies to the energy (E_e) associated with the number of electrons in each shell

Shell					
Formulas	F_e / F_g	FS / PE_e	KE / R_γ	PE_e / R_γ	KE / PE_e
Units					
n					
1	4.40742111792335E-40	-5.87974678522222E-12	1.4	-2	-0.7
2	4.40742111792335E-40	-5.87974678522222E-12	1.4	-2	-0.7
3	4.40742111792335E-40	-5.87974678522222E-12	1.4	-2	-0.7
4	4.40742111792335E-40	-5.87974678522222E-12	1.4	-2	-0.7
5	4.40742111792335E-40	-5.87974678522222E-12	1.4	-2	-0.7

Table 8: Constants

5. Claims

Claim 1: The classical theory of electron behaviour in atoms is not correct

Claim 2: Newton's '*laws of motion*' should be used to evaluate the behaviour of electrons in atoms

Appendices

Appendix 1: Papers, Mathematical Constants, Formulas, Symbols & Units

Appendix 1: Papers, Mathematical Symbols & Units

Radius of electron shell 1: 5.291772106700E-11 m

Isaac Newton's gravitational constant: G = 6.67359232004332E-11 $m^3/kg/s^2$

Coulomb's constant: k = 8.98755184732667E+09 $N.m^2/C^2$

Elementary charge: $Q_e = -Q_p$ = -1.60217648753000E-19 C

Universal density: ρ = 7.12660796350450E+16 kg/m^3

This paper should be read in conjunction with the following:

http://calqlata.com/Papers/G.pdf

http://calqlata.com/Maths/Formulas_Laws_of_Motion.html

http://calqlata.com/Maths/Formulas_Rydberg_Atom.html

http://calqlata.com/Maths/Formulas_Planck_Atom.html

http://calqlata.com/Maths/Formulas_Newton_Atom.html

http://calqlata.com/Papers/Spin.pdf

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