Contact: info@calqlata.com

The Atom (Rev. 1.1)

By Keith Dixon-Roche © 17/04/2018

1.0 Introduction

This paper pulls together all of the previous work compiled by the author with a view to describing the atom using Isaac Newton's laws of motion and Coulomb's law.

It is claimed (by the author) that, contrary to popular belief, Isaac Newton's laws of motion apply to all branches of science, including atomic and that the atom is a far more elegant and simpler system than hitherto believed.

This study of Isaac Newton's work has revealed that there are probably only three sub-atomic particles, i.e. there is no need for further sub-division into quarks, leptons, fermions, etc.

The purpose of this paper is to provide a literary and theoretical description of the atomic model along with the energies that cause it to exist in its various states; gas, liquid and solid

The calculations in this paper provide the mathematical basis for;
1) inverse proportionality of electron velocity to its orbital radius
2) relationship between electron velocity and temperature
3) electron shells
4) the origin of the neutron

2.0 The Atom

The atom is simple, elegant and a brilliant piece of engineering. Whilst all the information needed to understand it was available at the end of the 19th century, it has continued to elude us.

3.0 Atomic Particles

Atomic particles are pictorially represented here as solid spherical objects for convenience only. It is not proposed that they are in any way spherical, solid or a specific size.

The atom comprises only three atomic particles that between them hold it together and naturally attract or repel other atoms. They are:

Electrons: non-polar magnetic packets of energy with negative electrical charge of fixed magnitude and perpetual but variable kinetic energy

Protons: non-polar magnetic packets of energy with a positive electrical charge of variable magnitude

Neutrons: protons and electrons combined through high temperature

Fig 1

The difference between electrical and non-polar magnetic, attractive and repulsive forces is 4.407E-40

4.0 Electro-Magnetic Radiation

Electro-magnetic energy is what we regard as heat and light. The various types of energy (light, radio, X, γ, etc.) are defined by an atom's nucleic structure and radiated in different wavelengths and we perceive as colour, noise, etc. The magnitude of a radiated energy wave; brightness, loudness, etc. is defined by its amplitude.

Orbiting electrons continuously collect electro-magnetic energy (*heat*) converting it into kinetic energy (increasing their velocity). In doing so, proton-electron pairs

generate (and radiate) electro-magnetic energy, simultaneously reducing kinetic energy in the electrons. This process of energy transfer continues only whilst orbiting electrons continue to collect electro-magnetic energy.

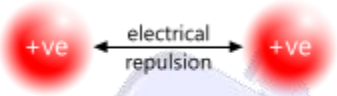


Fig 2

As the velocity of an orbiting electron increases, its orbital radius decreases and the electro-magnetic energy radiated by its proton increases along with the magnetic attraction between the proton, the electron and the neutron (Fig 5). I.e. the strength of an atomic assembly rises with increasing kinetic energy in the electron (i.e. increasing temperature).

Electro-magnetic radiation is deflected as it passes a large body e.g. a planet or star because of magnetic attraction, i.e. what we currently understand as gravity.

5.0 Electron Shells

Each electron shell contains up to two electrons, both of which are identical. They are held in their shells by a balancing act between the electrical repulsion from each other (including those in the next shell(s)), and the attraction to their protons in exactly the same way as Newton described the balance between centrifugal force and gravitational force in an orbiting satellite and its force-centre.

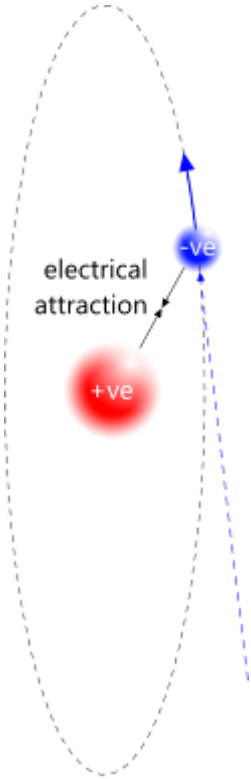


Fig 3

6.0 How Atoms Work:

Electrons and protons possess the same electrical charge when at rest ($N_t = 1$). The electrical charge in the electron never changes but that of the proton varies with the speed of its orbiting electron

Lone protons will always consistently repel each other with equal force due to their identical electric charges. This is the most basic form of matter; what we call hydrogen gas. Lone protons can never accumulate in solid or even liquid

form because the repulsion force is constant everywhere within the volume they occupy (Fig 2).

A proton can trap a slow-moving electron if it passes close enough to enable the opposite electrical charges to engage (Fig 3). Once trapped, the electron will remain in orbit around the proton until one of the two following events occur:

1) An adjacent atom provides sufficient excessive electro[-magnetic] charge to cause it to swap orbits, or
2) Another electron impacts it with sufficient energy to knock it out of its orbit

An electron's orbit is circular because the electron is providing its own kinetic energy; i.e. it is not generated by the potential energy between it and its proton.

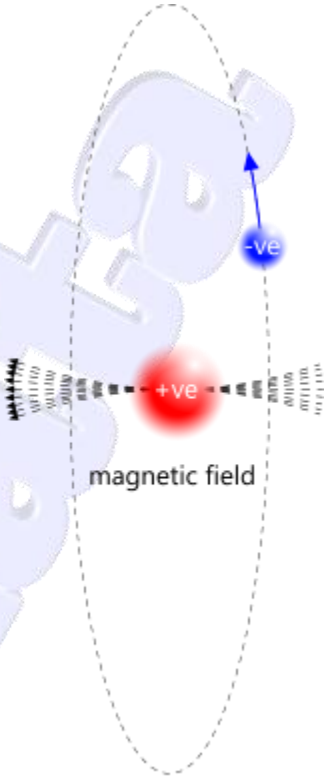


Fig 4

A proton with an orbiting electron naturally generates a magnetic field with a positive (e.g. N) pole at one face of the orbit and a negative (e.g. S) pole at the other (Fig 4), empowering the proton-electron pair to attract a neutron. This is what we call deuterium (Fig 5).

As the kinetic energy in orbiting electrons rises, the [electro-]magnetic attraction between the protons and neutrons within the same electron shells increases and continues to do so as long as all protons within a nucleus are electrically isolated from each other by surrounding neutrons.

Fusion, the joining of separate electron-proton pairs to create a different element, is accomplished by applying sufficient pressure to force two nuclei together such that their combined electron shells locate them within the same electro-magnetic field.

6.1 The State of Matter

Magnetic and electrical charges are both active across atomic boundaries (outside the atomic shells), but whilst magnetic charges between neighbouring atoms are attractive, electrical charges are repulsive.

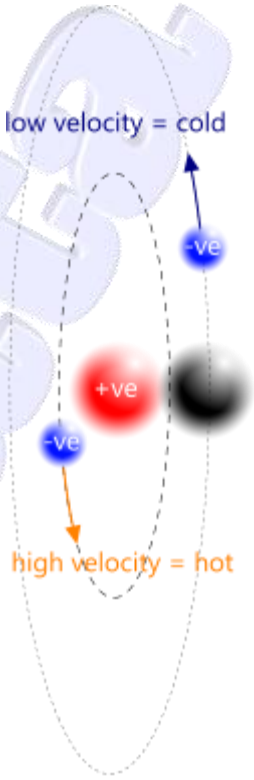


Fig 5

At relatively low *temperatures*, accumulative non-polar and [electro-]magnetic polar magnetic attraction is greater than the repulsion between adjacent atoms caused by the additional electrical charges generated in the protons. As the *temperature* rises, however, the stronger repulsive electrical charges will eventually force atoms apart. The *temperature* at which this occurs depends upon the size and structural matrix of the atomic nuclei concerned. As a general rule, the greater the number of proton-electron pairs in a single nucleus, the greater the magnetic attraction; i.e. the higher the melting *temperature*.

Solid matter is that in which adjacent atoms are attracted to each other via magnetic attraction.

Liquid matter is that in which adjacent atoms repel each other via electro-magnetic electrical energy. The repulsion force ($F = k.q^2/R^2$) between adjacent atoms is less than that induced by magnetic (gravitational) attraction from the supporting planetary mass. Surface tension also plays its part in liquid retention but is not considered here.

Gaseous matter is that in which adjacent atoms repel each other via electro-magnetic electrical energy. The repulsion force ($F = k.q^2/R^2$) between adjacent atoms is greater than that induced by magnetic (gravitational) attraction from the supporting planetary mass. Each gaseous atom settles once the magnetic (gravitational) force due to its '*height'* (distance from the supporting planetary mass) balances with the atomic separation force. Gaseous atoms only repel other atoms with the same magnetic charge (Dalton's law)

As the number of proton-electron pairs increases within an atom, its ability to attract adjacent atoms also increases but the less stable they become. The ability for atomic particles to remain together (within an atom) is strong up to and including the size of an iron atom (Z=26). Atomic nuclei larger than this tend to lose proton-electron pairs, e.g. the gradual reduction of uranium into lead. As a general rule (but there are exceptions; e.g. lead, zirconium) the larger the atom the faster the rate of disintegration, which is influenced by the nucleic structure

Fig 6

When matter, e.g. steel, is heated, we see the colour change with temperature. At low heat (electro-magnetic energy), only long (red) wavelengths are emitted. As the heat increases shorter (blue) wavelengths will be emitted (Fig 6). As temperature rises to a gaseous condition all wavelengths mix and the colour becomes white. It is important to note that very little electro-magnetic energy is emitted by cold material ($<\approx 10$K) and is the reason black-bodies emit negligible electro-magnetic radiation.

6.2 Isotopes

Isotopes are atoms with the same atomic number (Z) but with varying atomic *mass* due to unequal proton-neutron pairing.

For example; an atom of iron, with 26 protons and 26 neutrons is an isotope of 52. However, in nature, most iron atoms have more than 26 neutrons, each of which is given its own isotope, e.g. 57, 59, etc.

Over time, the electro-magnetic magnetism generated by atomic nuclei will split surplus neutrons into their component parts, changing the atom into a different element. As the number of protons increases, the atoms will become less stable (stability is determined by nucleic structure) and subsequently divide into smaller atoms. The rate at which this occurs is referred to as the half-life of the atom. The half-life of any atom is a constant, it never changes.

Apart from oxygen all atoms naturally have more neutrons than protons.

6.3 Ions

Ions are atoms with the same atomic number (Z) but possess an electrical charge due to unequal proton-electron pairing.

Positive ions (atoms that have lost electrons) possess a positive electrical charge. Negative ions (atoms with additional electrons) possess a negative electrical charge. Negative ions are far less common than positive ions.

Only a few atoms exist naturally as negative ions and they are all non-metals^{N} except for two, which are semi-metals^{S}:
One additional electron (Group VIIA):
Fluorine (9^{N}), Chlorine (17^{N}), Bromine (35^{N}), Iodine (53^{N})
Two additional electrons (Group VIA):
Oxygen (8^{N}), Sulphur (16^{N}), Selenium (34^{N}), Tellurium (52^{S})
Four additional electrons (Group IVA):
Carbon (6^{N}), Silicon (14^{S})

Any atom can become a positive ion simply by losing one or more of its electrons from impact with free electrons or a strong external positive electrical charge.Negatively charged ions are a little more difficult to understand. Additional electrons need to be trapped by the positive charge in protons that do not exist in the nucleus, which shouldn't be possible. However, the nucleic structures of the above non-metal atoms probably have at least one exposed proton that is not protected by a neutron, which means that the additional electro-magnetic electrical charge generated in it is available to trap passing free electrons

6.4 Free Electrons

Electrons emitted from an atom will hold their linear (v) and angular (ω) velocities at the time of ejection in free flight until affected by impact, gravity and/or electro-magnetic energy. What we see in bubble chambers as post-impact spiral paths is simply the result of impacting electrons that can be visualised as spinning billiard balls obeying newton's laws of motion.
Angular velocity in an electron is: $\omega = 2\pi$ / orbital period (at the time of ejection)
The linear velocity of an electron is: $v = \sqrt{[2.KE / m]}$ (at the time of ejection)

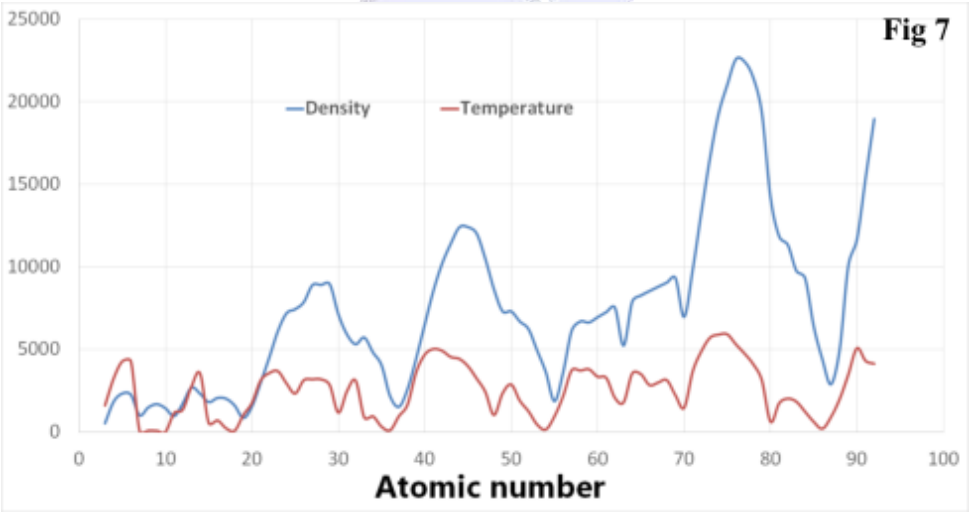
7.0 Atomic Modelling

Mathematical models of this atomic structure have been created for a number of atoms (including iron) at various temperatures using Coulomb's law of electrical attraction, Newton's laws of orbital motion and the laws of thermodynamics (refer to Appendix).

8.0 Density vs Temperature

Given that; temperature effects (e.g. gasification) are dependent upon a repulsive electrical charge between adjacent atoms and density is dependent upon an attractive magnetic charge between those same atoms, and that both charges are created by the same electro-magnetic energy generation process (electrons orbiting protons), density and temperature should follow similar patterns of behaviour according to the number of nucleic protons (atomic number (Z)).

This relationship, between electrical repulsion and magnetic attraction, can clearly be seen in the temperature/density vs atomic number plot shown below.



The above-mentioned relationship is governed by the structure of the nucleus and is the last significant piece of the atomic puzzle. Whilst it can be resolved mathematically, it has not been addressed here because it is not part of Isaac Newton's laws of orbital motion.

Corollary 22: Satellites in circular orbits generate their own kinetic energy

Corollary 23: All heat (electro-magnetic energy) is radiated

Corollary 24: Conduction is the transfer of radiated energy between electrons within solid or liquid matter

Corollary 25: Convection is the movement of liquidous or gaseous atoms to a position whereby its high electro-magnetic energy can be transferred (radiated); i.e. to a region of atoms at a lower temperature where atomic spacing is greatest [second law of dynamics]

Hypothesis 6: Electrons gain kinetic energy from electro-magnetic radiation, but they can only lose it via proton-electron pairing or impact.

Hypothesis 7: A lattice structure is dependent upon the atomic nucleic matrix

Hypothesis 8: Only atoms of identical nucleic construction can generate lattice structures

Hypothesis 9: Only atoms of identical magnetic charge can repel each other

8.0 Energy

Relative atomic mass: $RAM = N_A.m_1$
Relative atomic charge: $RAC = N_A.q_1$
Proton: RAM_P = 1.00727638277233 kg/mol; RAC_P = 96485.3317942156 C/mol (Faraday's constant)
Electron: RAM_e = 0.000548580318390698 kg/mol; RAC_e = 96485.3317942156 C/mol (Faraday's constant)
Quanta charge per unit mass: q_P = 175881869180.545 C/kg

A2.1 Coupling Ratio

The ratio between gravitational and electrical energy (φ) can be defined using atomic particles as follows:

$E_g = G.m_1.m_2 / R$

$E_e = k.q_1.q_2 / R$

$\varphi = E_g / E_e = G.m_1.m_2 / k.q_1.q_2$

$$\varphi = \frac{6.67359232004334E\text{-}11 \times 9.1093897E\text{-}31 \times 1.67262163783E\text{-}27}{8.98755184732667E+09 \times 1.60217648753E\text{-}19 \times 1.60217648753E\text{-}19}$$

φ = 4.40742111792334E-40

This means that gravitational (magnetic) energy can only alter the density of matter if there is sufficient mass to generate the necessary pressure (1/φ)

A2.2 Heat

All heat energy is radiated. Convection and conduction are simply different forms of radiation.

Convection: Heat is said to rise because atoms with the highest [kinetic] energy electrons will generate the greatest magnetic repulsion energy. Separation forces will therefore balance furthest from the source of gravitational (magnetic) attraction.

Conduction: Heat passes through any solid, liquid or gas as a result of the transfer of radiated electro-magnetic energy between electrons in adjacent atoms.
For an electron at rest:

$R_a = R_i/RAM$

RAM_e = 0.00054858031839 g/mol
R_a = 15156.3563034308 J/K/g
N_v = 1.5 & N_ϱ = 2.5

$c_v = R_a.N_v = R_a.(N_\varrho-1)$ = 22734.5344551462 J/K/g
$c_\varrho = c_v+R_a = R_a.N_v+R_a = R_a.(N_v+1)$ = 37890.8907585769 J/g/K
$N_v = N_\varrho-1 = N_\varrho-N_t$
$\underline{T} = \exp(R_a.L_n(N_t)/c_\varrho) = 1$

so @ rest; $N_t = 1$ & $\underline{T} = 1K$

The relationship between electron velocity and temperature may be defined as;
$\underline{T} = \mathbf{X}.v^2/q^2$
where $\mathbf{X}$ = 1.5E+12 $K.C^2.s^2 / kg^2.m^2$
Note: $\sqrt{[G/k]}.RAC / N_t.R_i$ = 1E-6 $K.C^2.s^2/kg^2.m^2$; where k is Coulomb's constant, G is Newton's gravitational constant, RAC is relative atomic charge and R_i is the ideal gas constant

It is interesting to note that $\underline{T} = X.v^2 / q^2$ is similar to Newton's gravitational force $F = G.m_1.m_2 / R^2$, Coulomb's force $F = k.Q_1.Q_2 / R^2$, and Gilberts and Maxwell's formulas for force and energy. It is therefore anticipated (by the author) that all of these formulas will eventually become just two; one for magnetism (gravity) and the other for electrical charge, or three; another for electro-magnetic energy.

Heat energy in the atom; $E_a = c_\varrho.m_e.\Sigma n.\underline{T}_e$
where; 'c_ϱ' is the specific heat capacity of an electron, 'm_e' is its mass & 'n' is the number of electrons at temperature '$\underline{T}_e$'
The [effective] temperature of the atom is; $\underline{T} = E_a / m.c_\varrho$
where 'm' is the total mass of electrons in the atom
The size of the iron atom must therefore have been measured at an effective temperature of 278.94K

9.0 The Theory

The symbols used in the following Tables can be found in Appendix A1

The calculation results (Tables 5 to 9) have been derived from Newtons laws of orbital motion in Table 1 and Coulomb's law: $F = k.Q^2/R^2$

T	**1.17608**	**1.4427**	**273.15**	**1000**	**6000**	**K**
G	6.67E-11	6.67E-11	6.67E-11	6.67E-11	6.67E-11	$m^3/kg/s^2$
m_1	1.67E-27	1.67E-27	1.67E-27	1.67E-27	1.67E-27	kg
m_2	9.11E-31	9.11E-31	9.11E-31	9.11E-31	9.11E-31	kg
T	1.86E-52	1.37E-52	5.25E-56	7.49E-57	5.10E-58	s
a	4.60E-48	3.75E-48	1.98E-50	5.41E-51	9.02E-52	m
b	4.60E-48	3.75E-48	1.98E-50	5.41E-51	9.02E-52	m
e	0	0	0	0	0	
p	4.60E-48	3.75E-48	1.98E-50	5.41E-51	9.02E-52	m
f	4.60E-48	3.75E-48	1.98E-50	5.41E-51	9.02E-52	m
x'	0	0	0	0	0	m
L	2.89E-47	2.36E-47	1.25E-49	3.40E-50	5.67E-51	m
K	3.54E+38	3.54E+38	3.54E+38	3.54E+38	3.54E+38	s^2/m^3
A	6.65E-95	4.42E-95	1.23E-99	9.20E-101	2.56E-102	m^2
$\hat{R}$	**4.60E-48**	**3.75E-48**	**1.98E-50**	**5.41E-51**	**9.02E-52**	**m**
$\check{F}$	4.80E+27	7.22E+27	2.59E+32	3.47E+33	1.25E+35	N
F_c	4.80E+27	7.22E+27	2.59E+32	3.47E+33	1.25E+35	N
g	-5.27E+57	-7.93E+57	-2.84E+62	-3.81E+63	-1.37E+65	m/s^2
$\check{v}$	**1.56E+05**	**1.73E+05**	**2.37E+06**	**4.54E+06**	**1.11E+07**	**m/s**
h	7.17E-43	6.47E-43	4.70E-44	2.46E-44	1.00E-44	m^2/s
PE	-2.21E-20	-2.71E-20	-5.13E-18	-1.88E-17	-1.13E-16	N.m
KE	1.11E-20	1.36E-20	2.57E-18	9.39E-18	5.64E-17	N.m
E	-1.11E-20	-1.36E-20	-2.57E-18	-9.39E-18	-5.64E-17	N.m
$\check{R}$	**4.60E-48**	**3.75E-48**	**1.98E-50**	**5.41E-51**	**9.02E-52**	**m**
$\check{R}$	**4.60E-48**	**3.75E-48**	**1.98E-50**	**5.41E-51**	**9.02E-52**	**m**
$\hat{F}$	4.80E+27	7.22E+27	2.59E+32	3.47E+33	1.25E+35	N
F_c	4.80E+27	7.22E+27	2.59E+32	3.47E+33	1.25E+35	N
g	-5.27E+57	-7.93E+57	-2.84E+62	-3.81E+63	-1.37E+65	m/s^2
$\hat{v}$	**1.56E+05**	**1.73E+05**	**2.37E+06**	**4.54E+06**	**1.11E+07**	**m/s**
h	7.17E-43	6.47E-43	4.70E-44	2.46E-44	1.00E-44	m^2/s
PE	-2.21E-20	-2.71E-20	-5.13E-18	-1.88E-17	-1.13E-16	N.m
KE	1.11E-20	1.36E-20	2.57E-18	9.39E-18	5.64E-17	N.m
E	-1.11E-20	-1.36E-20	-2.57E-18	-9.39E-18	-5.64E-17	N.m
ω	3.38E+52	4.60E+52	1.20E+56	8.39E+56	1.23E+58	$^c/s$
PE/KE	-2	-2	-2	-2	-2	

Table 5 Electron Velocities in an Hydrogen Atom at Various Temperatures
$\check{F}$ & $\hat{F}$ are calculated using Newton's law: $F = G.m_1.m_2 / R^2$

The following Table comprises the calculation results from the incorporation of Coulomb's force

T	**1.17608**	**1.4427**	**273.15**	**1000**	**6000**	**K**
k	8.99E+09	8.99E+09	8.99E+09	8.99E+09	8.99E+09	$N.m^2/C^2$
Q_1	1.60E-19	1.60E-19	1.60E-19	1.60E-19	1.60E-19	C or A/s
Q_2	1.60E-19	1.60E-19	1.60E-19	1.60E-19	1.60E-19	C or A/s
T	1.77E-07	1.30E-07	4.99E-11	7.13E-12	4.85E-13	s
a	1.04E-08	8.51E-09	4.50E-11	1.23E-11	2.05E-12	m
b	1.04E-08	8.51E-09	4.50E-11	1.23E-11	2.05E-12	m
e	0	0	0	0	0	
p	1.04E-08	8.51E-09	4.50E-11	1.23E-11	2.05E-12	m
f	1.04E-08	8.51E-09	4.50E-11	1.23E-11	2.05E-12	m
x'	0	0	0	0	0	m
L	6.56E-08	5.35E-08	2.83E-10	7.72E-11	1.29E-11	m
K	2.74E+10	2.74E+10	2.74E+10	2.74E+10	2.74E+10	s^2/m^3
A	3.43E-16	2.28E-16	6.35E-21	4.74E-22	1.32E-23	m^2
R̂	**1.04E-08**	**8.51E-09**	**4.50E-11**	**1.23E-11**	**2.05E-12**	**m**
F̌	2.12E-12	3.18E-12	1.14E-07	1.53E-06	5.51E-05	N
F_c	2.12E-12	3.18E-12	1.14E-07	1.53E-06	5.51E-05	N
g	-1.32E+07	-1.99E+07	-7.12E+11	-9.55E+12	-3.44E+14	m/s^2
v̌	3.71E-01	4.11E-01	5.66E+00	1.08E+01	2.65E+01	m/s
h	3.88E-09	3.50E-09	2.54E-10	1.33E-10	5.43E-11	m^2/s
PE	-2.21E-20	-2.71E-20	-5.13E-18	-1.88E-17	-1.13E-16	N.m
KE	1.11E-20	1.36E-20	2.57E-18	9.39E-18	5.64E-17	N.m
E	-1.11E-20	-1.36E-20	-2.57E-18	-9.39E-18	-5.64E-17	N.m
Ř	**1.04E-08**	**8.51E-09**	**4.50E-11**	**1.23E-11**	**2.05E-12**	**m**
Ř	**1.04E-08**	**8.51E-09**	**4.50E-11**	**1.23E-11**	**2.05E-12**	**m**
F̂	2.12E-12	3.18E-12	1.14E-07	1.53E-06	5.51E-05	N
F_c	2.12E-12	3.18E-12	1.14E-07	1.53E-06	5.51E-05	N
g	-1.32E+07	-1.99E+07	-7.12E+11	-9.55E+12	-3.44E+14	m/s^2
v̂	3.71E-01	4.11E-01	5.66E+00	1.08E+01	2.65E+01	m/s
h	3.88E-09	3.50E-09	2.54E-10	1.33E-10	5.43E-11	m^2/s
PE	-2.21E-20	-2.71E-20	-5.13E-18	-1.88E-17	-1.13E-16	N.m
KE	1.11E-20	1.36E-20	2.57E-18	9.39E-18	5.64E-17	N.m
E	-1.11E-20	-1.36E-20	-2.57E-18	-9.39E-18	-5.64E-17	N.m
ω	3.56E+07	4.83E+07	1.26E+11	8.82E+11	1.30E+13	$^c/s$
PE/KE	-2	-2	-2	-2	-2	

Table 6 Electron Orbital Radii by Applying Coulomb's Law to Table 5
Ř & F̂ are calculated using Coulomb's law: $F = k.Q_1.Q_2 / R^2$

9.1 The Neutron

$RAC = k_B.R_i.Q_e$ = 96485.3317942156 C/mol (of electrons)
Note: Faraday's constant = 96485.3317942158 C/mol {exact}

Rest condition @ $\underline{T}$ = 1K:
$N_t = 1$; $N_v = 1.5$; $N_\varrho = 2.5$

$RAM_\varrho = R_i.m_\varrho/k_B$ = 1.00727638277235 N
Note: RAM_H = 1.00794 g/mol
$RAM_e = RAM_\varrho . m_e/m_\varrho$ = 0.000548580318390698 g/mol
$R_a = RAM_e / R_i$ = 15156.3563034308 J/g/K
$R = R_a.m_e$ = 1.38065156E-23 J/K
k_B = 1.38065156E-23 J/K
$k_B.N_A.L_n(N_t) = c_\varrho.L_n(\underline{T}).RAM_e$ = 3.371231032 J/K/mol
$\exp(2.5xL_n(\underline{T})) = 1$

$c_v = N_t.R_a$ = 22734.5344551462 J/g/K
$C_v = m_e.c_v$ = 2.07097734E-23 J/K
$c_\varrho = c_v+R_a$ = 37890.8907585769 J/g/K
$C_\varrho = m_\varrho.c_v$ = 3.4516289E-23 J/K

$KE_e = kB.\underline{T}.N_\varrho$ = 3.4516289E-23 J

$X = N_t.RAC.e / R_i.m_e$ = 1.11157535506607E+12 $C^2.s^2.K / kg^2.m^2$
$\underline{T} = X . v^2/q^2$ K

According to Newton's orbital motion formula; v = R/g
'v' will be the speed of light (c) (Table10)
when:
R = orbital radius of 1.4666666 x ($r_\varrho + r_e$) = 2.81773E-15m
$g = G.m_\varrho / \varphi.R^2$ = 3.18988E+31m/s²

According to the author's formula; $\underline{T} = X.v^2 / q^2$
v = c @ a temperature of 3229761K assuming X = 1.112E+12 $C^2.s^2.K / kg^2.m^2$
and the iron atom (2.8E-10m) was measured at ≈-66.44°C (Table 9)

I.e a proton and its orbiting electron will combine to create a neutron at an average temperature of 7.9E+05K (Table 10) and an orbital radius of 2.818E-15m which occurs at the core of an active hydrogen star.

In close proximity to other neutrons and the electro-magnetic field generated by other proton-electron pairs, within the nucleus of an atom the neutron will gradually force the neutron to split apart into an electron and a proton. The rate at which this occurs is dependent upon the size and structure of the nucleus

A neutron therefore has no electrical charge but possesses a magnetic charge and its mass is that of a proton plus that of an electron

9.2 Electron Shells

Property	Symbol	Formula
orbital radius	R	Input (from Table 6)
arc separation distance	d	$\pi/n \,.\, (4.\pi.R^2) / (2.\pi.R)$
linear separation distance	ℓ	$R.Sin(½.d/R)$
gravitational acceleration at R	g	$G.m_1 / \varphi.R^2$
electron velocity	v	$\sqrt{[g/R]}$
gravitational energy	PE	$G.m_1.m_2 / R$
gravitational force	F	$G.m_1.m_2 / R^2$
electrical force (check)	F_e	$k \,.\, (q/R)^2$
electron temperature in shell 1 (check)	T	$½.m_2.v^2 / N_o.k_B$

Table 7 Electron Shell Distribution

The following results are for both electrons in shells 1 to 18 ($\underline{T}_1 = 1K$)

Shell	R	d	ℓ	g	v	PE	F	F_e	$\underline{T}$
1	8.51E-09	2.67E-08	8.51E-09	3.50E+18	172490	2.71E-20	3.18E-12	3.18E-12	**1.0691**
2	1.70E-08	5.35E-08	1.70E-08	8.74E+17	122000	1.36E-20	7.96E-13	7.96E-13	**0.5346**
3	2.55E-08	8.02E-08	2.55E-08	3.88E+17	99600	9.03E-21	3.54E-13	3.54E-13	**0.3564**
4	3.40E-08	1.07E-07	3.40E-08	2.18E+17	86200	6.78E-21	1.99E-13	1.99E-13	**0.2673**
5	4.26E-08	1.34E-07	4.26E-08	1.40E+17	77100	5.42E-21	1.27E-13	1.27E-13	**0.2138**
6	5.11E-08	1.60E-07	5.11E-08	9.71E+16	70400	4.52E-21	8.84E-14	8.84E-14	**0.1782**
7	5.96E-08	1.87E-07	5.96E-08	7.13E+16	65200	3.87E-21	6.50E-14	6.50E-14	**0.1527**
8	6.81E-08	2.14E-07	6.81E-08	5.46E+16	61000	3.39E-21	4.97E-14	4.97E-14	**0.1336**
9	7.66E-08	2.41E-07	7.66E-08	4.32E+16	57500	3.01E-21	3.93E-14	3.93E-14	**0.1188**
10	8.51E-08	2.67E-07	8.51E-08	3.50E+16	54500	2.71E-21	3.18E-14	3.18E-14	**0.1069**
11	9.36E-08	2.94E-07	9.36E-08	2.89E+16	52008	2.46E-21	2.63E-14	2.63E-14	**0.0972**
12	1.02E-07	3.21E-07	1.02E-07	2.43E+16	49793	2.26E-21	2.21E-14	2.21E-14	**0.0891**
13	1.11E-07	3.48E-07	1.11E-07	2.07E+16	47840	2.08E-21	1.88E-14	1.88E-14	**0.0822**
14	1.19E-07	3.74E-07	1.19E-07	1.78E+16	46100	1.94E-21	1.62E-14	1.62E-14	**0.0764**
15	1.28E-07	4.01E-07	1.28E-07	1.55E+16	44537	1.81E-21	1.42E-14	1.42E-14	**0.0713**
16	1.36E-07	4.28E-07	1.36E-07	1.37E+16	43122	1.69E-21	1.24E-14	1.24E-14	**0.0668**
17	1.45E-07	4.55E-07	1.45E-07	1.21E+16	41835	1.59E-21	1.10E-14	1.10E-14	**0.0629**
18	1.53E-07	4.81E-07	1.53E-07	1.08E+16	40656	1.51E-21	9.83E-15	9.83E-15	**0.0594**

Table 8 Electron in Shells 1 to 18

The following results are for both electrons in an iron atom ($\underline{T}_1 \approx 845K$)

Shell	R	d	ℓ	g	v	PE	F	F_e	$\underline{T}$
1	1.08E-11	3.38E-11	1.08E-11	2.18E+24	4.85E+06	2.14E-17	1.99E-06	1.99E-06	844.99
2	2.15E-11	6.77E-11	2.15E-11	5.46E+23	3.43E+06	1.07E-17	4.97E-07	4.97E-07	422.50
3	3.23E-11	1.02E-10	3.23E-11	2.43E+23	2.80E+06	7.14E-18	2.21E-07	2.21E-07	281.66
4	4.31E-11	1.35E-10	4.31E-11	1.36E+23	2.42E+06	5.36E-18	1.24E-07	1.24E-07	211.25
5	5.39E-11	1.69E-10	5.39E-11	8.73E+22	2.17E+06	4.28E-18	7.96E-08	7.96E-08	169.00
6	6.46E-11	2.03E-10	6.46E-11	6.07E+22	1.98E+06	3.57E-18	5.52E-08	5.52E-08	140.83
7	7.54E-11	2.37E-10	7.54E-11	4.46E+22	1.83E+06	3.06E-18	4.06E-08	4.06E-08	120.71
8	8.62E-11	2.71E-10	8.62E-11	3.41E+22	1.71E+06	2.68E-18	3.11E-08	3.11E-08	105.62
9	9.69E-11	3.05E-10	9.69E-11	2.70E+22	1.62E+06	2.38E-18	2.46E-08	2.46E-08	93.89
10	1.08E-10	3.38E-10	1.08E-10	2.18E+22	1.53E+06	2.14E-18	1.99E-08	1.99E-08	84.50
11	1.18E-10	3.72E-10	1.18E-10	1.80E+22	1.46E+06	1.95E-18	1.64E-08	1.64E-08	76.82
12	1.29E-10	4.06E-10	1.29E-10	1.52E+22	1.40E+06	1.79E-18	1.38E-08	1.38E-08	70.42
13	1.40E-10	4.40E-10	1.40E-10	1.29E+22	1.34E+06	1.65E-18	1.18E-08	1.18E-08	65.00

Table 9 Electrons in an Iron Atom (Ø = 2.8E-10m)
Average temperature of the atom in this condition is 206.7K

The following results are for the innermost electrons orbiting ($\underline{T}_1 \approx 3.2E+06K$)

Shell	R	d	ℓ	g	v	PE	F	F_e	$\underline{T}$
1	**2.82E-15**	8.85E-15	2.82E-15	3.19E+31	**3.00E+08**	8.19E-14	29.058	29.058	3229761
2	5.64E-15	1.77E-14	5.64E-15	7.98E+30	2.12E+08	4.09E-14	7.2645	7.2645	1614881
3	8.45E-15	2.66E-14	8.45E-15	3.54E+30	1.73E+08	2.73E-14	3.2287	3.2287	1076587
4	1.13E-14	3.54E-14	1.13E-14	1.99E+30	1.50E+08	2.05E-14	1.8161	1.8161	807440
5	1.41E-14	4.43E-14	1.41E-14	1.28E+30	1.34E+08	1.64E-14	1.1623	1.1623	645952
6	1.69E-14	5.31E-14	1.69E-14	8.86E+29	1.22E+08	1.37E-14	0.8072	0.8072	538294
7	1.97E-14	6.20E-14	1.97E-14	6.51E+29	1.13E+08	1.17E-14	0.593	0.593	461394
8	2.25E-14	7.08E-14	2.25E-14	4.98E+29	1.06E+08	1.02E-14	0.454	0.454	403720
9	2.54E-14	7.97E-14	2.54E-14	3.94E+29	9.99E+07	9.10E-15	0.3587	0.3587	358862
10	2.82E-14	8.85E-14	2.82E-14	3.19E+29	9.48E+07	8.19E-15	0.2906	0.2906	322976

Table 10 Electron in Shells 1 to 10 ($v_1 = c$)
Average temperature of the atom in this condition is 7.9E5K

Appendix: Glossary, References, Constants, Symbols & Units

This Appendix contains the definitions, symbols, constants and formulas used throughout this book.

A1.1 Glossary

Atomic Particle	One of the three components that comprise an atom
Black-Body	A collection of Quanta with sufficient magnetic (gravitational) energy to trap Quanta and cold enough not to emit electro-magnetic radiation in the light frequencies. Frequently referred to as '*Black-Holes*'
Hades	The Black-Body at the centre of the Milky Way galaxy
Sub-Atomic Particle	The many particles said to comprise atomic particles
Ultimate-Body (hypothesis)	A body that contains all the Quanta in the universe (≈7E+74) and represents the largest single body size that can exist without compromising the integrity of its innermost Quanta under magnetic (gravitational) pressure. A 'Big-Bang' (release of all Quanta and electro-magnetic energy holding the quantity together in the form of atoms) will occur if this number is exceeded
Ultimate Density	The mass-density of all three atomic particles $\rho = 7.12660796350449E+16$ kg/m³ Nothing in nature has a mass-density greater than this value

A1.2 References

Those that wish to view more detailed proofs and explanations may find them on CalQlata's website via the following relevant links:

1) http://calqlata.com/Maths/Formulas_Laws_of_Motion.html
2) http://calqlata.com/Maths/Formulas_Heavenly_Bodies.html
3) http://calqlata.com/Maths/Formulas_Orbits.html
4) http://calqlata.com/Maths/Formulas_Planetary_Spin.html
5) http://calqlata.com/Maths/Formulas_Core_Pressure.html
6) http://calqlata.com/Maths/Formulas_Magnetic_Field.html
7) http://calqlata.com/Maths/Formulas_Big_Bang.html
8) http://calqlata.com/Maths/Formulas_Dark_Matter.html
9) http://calqlata.com/Maths/Formulas_Rydberg_Atom.html
10) http://calqlata.com/Maths/Formulas_Planck_Atom.html
11) http://calqlata.com/Maths/Formulas_Classical_Atom.html
12) http://calqlata.com/Maths/Formulas_Newton_Atom.html
13) http://calqlata.com/Maths/Formulas_The_Atom.html

A1.3 Symbols

Symbol	Description	Units
$\underline{T}$	temperature	K
G	Newton's gravitational constant [6.67359232E-11]	$m^3/kg/s^2$
m_1 & m_ϱ	proton mass [1.67262163783E-27]	kg
m_2 & m_e	electron mass [9.1093897E-31]	kg
t	orbital period	s
a	major semi-axis	m
b	minor semi-axis	m
e	eccentricity (of orbit)	
p	half-parameter (of orbital path)	m
f	focus distance from Perihelion/Perigee	m
x'	distance from focus to ellipse centre	m
L	ellipse circumference	m
K	factor	s^2/m^3
A	orbit total area (sectional)	m^2
R, Ř & $\hat{R}$	distance between force centre and satellite	m
F, $\hat{F}$ & Ǧ	centripetal force on orbiting body (gravitational and electrical)	N
	centrifugal force on satellite	N
F_c	gravitational acceleration on satellite	m/s^2
g	Orbital velocity of satellite	m/s
v, $\hat{v}$ & $\check{v}$	Newton's motion constant	m^2/s
h	gravitational energy between force centre and satellite	J
PE	kinetic energy in satellite	J
KE	total energy in a satellite	J
E	angular velocity of satellite	$^c/s$
ω	magnetic:electrical force ratio [4.40742111792335E-40]	$N.m^2/C^2$
φ	Coulomb's constant [8.98755184732667E+09]	J/K/mol
k	ideal gas constant [8.314478766579]	J/K/kg
R_i	specific gas constant (mass)	J/K
R_a	gas constant (of a specified mass)	C
R	proton electrical charge [2.94183820093E-16]	C
Q_1 & Q_ϱ	electron electrical charge [1.60217648753E-19]	C/kg
Q_2 & Q_e	charge capacity [175881869180.55]	J/K/C
q	specific charge constant [0.00008617350]	
$Ç_e$		

Symbol	Description	Units
R	gas constant	J/K
kB	Stefan/Boltzmann constant [1.38065156E-23]	J/K
NA	Avogadro's number (constant) [6.02214129E+23]	/mol
e	elementary charge unit [1.60217648753E-19]	C
ε_0	Permittivity of free-space [8.85418775855161E-12]	F/m
μ_0	magnetic constant [1.25663706143592E-06]	H/m
F	Faraday's constant [96485.3317942158]	C/mol
r_1 & r_ϱ	proton radius [1.77613270336827E-15]	m
r_2 & r_e	electron radius [1.45046059426276E-16]	m
RAM_ϱ	relative atomic mass of a proton [1.00727638277233]	g/mol
RAM_e	relative atomic mass of an electron [0.00054858031839]	g/mol C/mol
RAC	relative atomic charge [96485.3317942158]	
N_t	microstate (constant temperature) [1.5 at rest]	
N_v	microstate (constant volume) [1.5 at rest]	
N_ϱ	microstate (constant pressure) [2.5 for atomic particles]	
c_v	specific heat capacity (constant volume)	J/g/K
C_v	heat capacity (constant volume)	J/K
c_ϱ	specific heat capacity (constant pressure) [37890.8907585769]	J/g/K
C_ϱ	heat capacity (constant pressure) [3.4516289E-23]	J/K
q_v	specific charge capacity (constant volume)	J/C
Q_v	charge capacity (constant volume)	J
q_ϱ	specific charge capacity (constant pressure) [0.000215433750705031]	J/C
Q_ϱ	charge capacity (constant pressure) [3.4516289E-23]	J
E_o	electrical field (electron at rest)	N/C
v_1	velocity of an electron at $\underline{T}$ = 1K (N_t = 1.0)	m/s
B	magnetic field	N.s / C.m
H	Henry	H
V_ϱ	Volume of a proton	m^3
V_e	Volume of an electron	m^3
F^N	Gravitational force according to Newton	N
F^P	Gravitational force according to Planck	N

A1.4 Related Formulas & Constants

The Milky Way's force-centre is referred to in this book as '***Hades***'

Gravity vs Electricity: $G.m_e.m_\varrho / k.Q_e.Q_\varrho = 4.40742111792335E\text{-}40$

$N_t = \exp(2.5 \,.\, L_n(\underline{T}))$
$N_v = e_v / R_e = c_v / R_a$
$N_\varrho = e_\varrho / R_e = c_\varrho / R_a$

$c_\varrho.L_n(\underline{T}).RAM = e_\varrho.L_n(\underline{T}).RAC = k_B.N_A.L_n(N_t)$

Equidistant arc-length between 'n' points on the surface of a sphere: $d = \pi.A / C.n$
Linear distance across arc-length 'd' (above): $\ell = R.\mathrm{Sin}(\tfrac{1}{2}.d/R)$

Velocity (v_1) of an electron at a temperature of 1K = 8705.27320175272 m/s

Velocity temperature relationship of an electron: $v = \exp(Ln(\underline{T})/2 + Ln(v_1))$

RAM of a proton = 1.00727638277233 g/mol (RAM of an hydrogen atom)
RAM of an electron = 0.00054858031839 g/mol
RAC of a proton = 177161652.983418 C/mol
RAC of an electron = 96485.33179 C/mol (Faraday's constant)

Specific gas constant of a particle: R_a = 15156.3563034308 J/g/K
Gas constant of a proton: R = 2.53508495037794E-20 J/K
Gas constant of an electron: R = 1.38065156E-23 J/K (Stefan-Boltzmann constant)

Particle microstates at temperature 1.17607902252467 K:
$N_v = 1.5$; $N_t = 1.5$; $N_\varrho = 2.5$

Heat Properties:
Specific heat capacity: c_v = 22734.5344551462 J/g/K (constant volume)
Specific heat capacity: c_ϱ = 37890.8907585769 J/g/K (constant pressure)
Specific charge capacity: q_v = 0.000129260250423019 J/C (constant volume)
Specific charge capacity: q_ϱ = 0.000215433750705031 J/C (constant pressure)

Charge capacity: Q = RAC/RAM = 175881869.180547 C/g

The gravitational energy between a proton and an electron within an atom is always twice the kinetic energy (in circular orbits) in the electron

The total energy (E) in an electron is always: E = KE + PE [PE is always negative]

Lorentz's Equation (magnetic force or field strength):
$F = Q.(E_o + v.B)$
Where:
$Q.E_o$ = electric force
$Q.v.B$ = magnetic force
$B = \mu_o.I / 2.\pi.R$
E_o = initial electric field
R = [orbital] radius
v = velocity