

The Basic Theory of Atom / Quantum with Energy

The Atom is everywhere, and it causes the shapes of all objects. Let's see the basics of atomic forces and elementary particles and energy & Mass of Atoms

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Abstract: *The Atoms are formed by elementary particles and atomic forces. The Particle are bound by strong and weak forces to form a proton and neutrons. The atom is formed by electromagnetic force and strong force.*

Keywords: Mass, Energy, Gravity, Atomic Force, Elementary Particles – Gluon, Quarks, Leptons, W & Z Bosons etc., Sub-Atomic Particles – Electrons, Neutrons, Protons, Atom

1. Introduction

1.1 The Four Forces of Nature

1) Property of Gluon: Strong Force

Quarks are attracted by strong force which originated from gluon and Quarks forms neutrons and protons by the attraction of Strong Force. Neutrons and protons are bound in nuclear by strong force of gluon. The strong force is the property of Gluon.

2) Property of Proton and Electron: Electromagnetic Force

Proton and electron attract each other by positive and negative electromagnetic forces. Both has a property of electromagnetic force.

3) Property of W and Z Boson: Weak Force.

W and Z bosons in nuclear can cause atomic change by decay. W and Z bosons have weak force as a property.

4) Property of Mass/Energy: Gravity

As it is stated by Einstein, a large sheet is the universe and in which we have multiple Mass particles like planets, black hole, etc., By the effect of the Mass & Energy, Gravity is initiated as a result of tension on the sheet by this Mass.

Based on the weight of the Mass, it tenses the sheet called universe because of this tension, Gravity is created in the universe.

As it is stated by Newton, GMm/R^2 is the formula of Gravity of a planet and an object.

G – Constant by newton, M – Mass of Planet, m – Mass of Object, R is the distance of both of planet & object's center Point.

1.2 The Major Elementary & Sub-Atomic Particles

Elementary Particles

- 1) **Quarks** – Up, Down, Top, Bottom, Charm, Strange
 - a) Up, Top, Charm Quarks has $2/3e$ – Electric Charges
 - b) Down, Bottom, Strange Quarks has $-1/3e$ – Electric Charges
- 2) **Leptons** – Electron, Electron Neutrino, etc.,

a) Electron has $-1e$ of electric charge.

b) Electron neutrino has $0e$ of electric charge

3) **Gluons** –

a) It is a Carrier of Strong Force to bind an atom strongly.

4) **Photon**

a) It is a carrier of Electromagnetic Waves.

5) **W & Z Boson**

a) It is the source of Weak Force

1.3 Sub-Atomic Particles

The Sub-Atomic particles are made with Elementary particles and forces of natures.

1) **Electrons**

It is a kind of leptons. It has a $-1e$ electric charges.

2) **Protons**

It is a combination of two Up quarks and one Down Quarks which are bound by Strong Force.

Two Up Quarks(U) = $2/3e + 2/3e$

One down Quarks(D) = $-1/3e$

Proton = $U+U+D = 2/3e+2/3e-1/3e = 1e$

3) **Neutrons**

It is a combination of two Down Quarks and One Up Quarks which are bound by Strong Force.

Tow Down Quarks(D) = $(-1/3e) + (-1/3e)$

One Up Quark(U) = $2/3e$

Neutron = $D+D+U = (-1/3e) + (-1/3e) + 2/3e = 0e$

4) **Positrons**

It is an anti-electron particle which has $+1e$ electric Charges. It will collide with electron and emits photons and electromagnetic waves.

5) **Antiprotons**

It is an anti-proton particle which has $-1e$ electric charges. It will collide with proton and emit waves.

6) **Neutrinos**

It is a charge less particles like neutron, but it does not the activity of neutron.

1.4 The Structure of Atom & Quantum Mechanism

a) **The Structure of Atom**

The Atom has multiple elementary particles inside it. The major particles are Quarks, Leptons, Gluon, W & Z Bosons. Gluon binds the UP & Down & Strange and Charm Quarks to form the Proton & Neutrons by Strong Force. The

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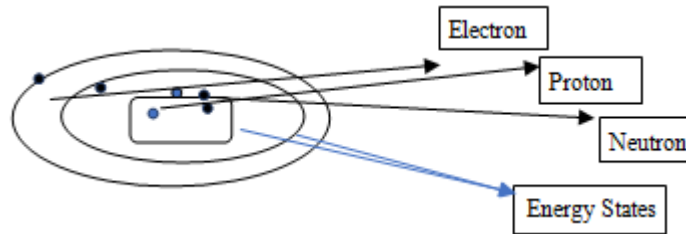
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Neutrons and Protons are bound by Gluon to form a nucleus with other elementary particles. The one type of lepton is Electron and electrons are attracted by Proton by electromagnetic force in different energy states. Proton has positive charge and Electron has negative charge with electromagnetic force. Nucleus are surrounded by different energy state from near to far so electrons which are placed in

near to far energy states are attracted by Protons, so it causes the central Fogel force to circle the electron along the energy states. Each electrons propels each other.

Finally, an atom with newtons, Protons and electrons are created with other elementary particles like gluon, muon, leptons, etc.



The Mechanism of this Sub-Atomic and Elementary particles inside an atom are known as Quantum mechanism.

The Quantum Mechanism:

The Quantum is done by Strong & electromagnetic Forces.

- 1) Strong force binds protons and neutron and nucleus to bind together.
- 2) Electromagnetic Force binds the electrons and protons, and it binds different elements and forms molecular.

Strong Force and Nucleus formation:

Up & Down Quarks' Combinations are bound by gluons to form proton and neutron:

Proton Formation/Binding:

Up Quarks (U) = 2/3e & Down Quarks(D) = -1/3e & Gluon(G) – Strong Force – 0 e & Proton = 1e
 Proton = Two Up Quarks + One Down Quark
 $U+U+D+Gluon = 2/3e + 2/3e + -1/3e + 0e = 4/3e-1/3e = 3/3e = 1 e \rightarrow P$ or Proton

Neutron Formation/Binding:

Up Quarks(U) = 2/3e & Down Quarks(D) = -1/3e & Gluon(G) – Strong Force – 0 e & Neutron = 0 e
 Proton = Two Down Quarks + One Up Quark
 $U+D+D+Gluon = 2/3e + -1/3e + -1/3e + 0e = 2/3e-2/3e = 0e \rightarrow N$ or Neutron

The nucleus:

The Proton & Neutron & nucleus are bound by the strong force of Gluon.

Electromagnetic Force to bind the electrons and protons and molecular:

Electromagnetic Forces is originated from Proton and Electron, and it causes for atomic force to orbit the Electron in its energy state of atom in interaction with Protons. GENERALLY, THE ELECTRONS WON'T STAY IN ONE ENERGY STATE AND IT MY ORBIT AROUND THE STATES SO EXACT FORCE IS DECIDED ON THE OBSERVATION.

Atomic Force Formula Representation by Coulomb Law:

F= Atomic Force
 q_1 = Charge of sub-atomic particles₁

q_2 =Charge of sub-atomic particles₂
 r =Distance between two sub-atomic particles
 $K=8.988 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2}$

- $F = K(q_1q_2)/r^2$ - Atomic Force between two particles
- $F = K(q)/r^2$ - Atomic Force Field of One Particle

Atomic Force Proton between Electron:

Charge of a Proton = $1.602176634 \times 10^{-19} \text{ C}$
 Charge of an Electron = $-1.602176634 \times 10^{-19} \text{ C}$
 Atomic Force of between Proton & Electron:
 Distance between proton and electron in hydrogen = 0.53 angstrom = $5.3E-11\text{M}$
 $F = (8.988 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2} * (1.602176634 \times 10^{-19} \text{ C} * -1.602176634 \times 10^{-19} \text{ C})) / ((5.3E-11)^2)$

Atomic Force between Electron& Electron:

Distance between two electrons: $5.3E-11\text{M}$
 $F = (8.988 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2} * (-1.602176634 \times 10^{-19} \text{ C} * -1.602176634 \times 10^{-19} \text{ C})) / ((5.3E-11)^2)$

Atomic Force between Proton & Proton:

Distance between two protons: $5.3E-11\text{M}$
 $F = (8.988 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2} * (1.602176634 \times 10^{-19} \text{ C} * 1.602176634 \times 10^{-19} \text{ C})) / ((5.3E-11)^2)$

1.5 Decay of Atoms

There are three decays of atoms. They are 1. Alpha Decay 2. Beta Decay 3. Gama Decay.

Alpha Decay

An alpha particle (Helium atom) is released in a heavy atoms/Elements and the atom/element is moved to other element by getting reduced two atomic numbers. The alpha particles with two protons and electrons remain like a helium atom.

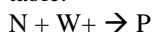
Beta Decay

There are two types of beta decays. They are 1. Beta Minus Decay and 2. Beta Plus Decay.

1) Beta Minus Decay

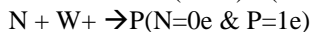
A Neutron of an atom is decayed into Proton and nucleus generates an electron in this decay. By the reaction of beta minus decay, Element is increased by 1 atomic number and

moved to next element which are represented in the Periodic table.



A "W Positive Boson" converts the Neutron to Proton. In a Neutron, there are two Down Quarks and one Up Quark so the W⁺ Boson converts a Down Quark to Up Quark in neutron therefore the neutron turns into proton.

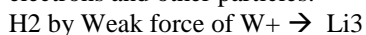
$$N = D+D+U = (-1/3e)+(-1/3e)+2/3e = 0 e$$



$$N+W^+ = D+D+U+W^+ = (-1/3e)+(-1/3e)+2/3e+1e = (-1/3e+1e)+(-1/3e)+2/3e = 2/3e+2/3e+(-1/3e) = 4/3e - 1/3e = 3/3e = 1e$$

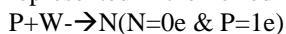
Therefore $N+w^+=1e=P(\text{Proton})$

In Response to conversion of charge, Nucleus creates electrons and other particles.



2) Beta Plus Decay

A Proton of an atom is decayed into neutron and positron and positron collides with an electron and the emits photons(light) so the Element is decrease by 1 atomic number and moved to previous element which are represented in the Periodic table.



A "W negative Boson" converts proton into neutron and positron. In proton, there are two up quarks and one down quark so the W⁻ Boson converts a Up quarks to Down quark therefore the proton turns into neutron.

$$P = U+U+D = (2/3e)+(2/3e)+(-1/3e) = 1 e$$

$$P+W^- = U+U+D+W^- = (2/3e)+(2/3e)+(-1/3e)-1e = (2/3e-1e)+(-1/3e)+2/3e = (2-3/3e)+(-1/3e)+2/3e = -1/3e + 1/3e + 2/3e = -2/3e + 2/3e = 0 e$$

$$P+W^-=0e=N$$

GAMMA Decay

Post the Alpha and Beta Decay, Gamma decay is happening. By collision of some particles, electromagnetic and photon & Other waves (X-Rays, Light, etc.) are delivered out of atom and it is known as Gamma ray.

The rays are spread across universe.

1.6 Algorithm of Energy

Perspective in the Energy Theory:

- Energy = Mass in another Dimension.
- Physical Measurement of Energy is Mass.
- The charge is the measure of the Kinetic Energy in Coulomb.
- Energy Science is a Study about structure of Atom in Energy Perspective.
- Actual Energy of Object is measured by the Energy of all atoms comprised in the Object.

1.7 Mass and Energy Equality in Atom/Elements:

$$E=MC^2$$

1. Atomic science reflects its dimensions on Energy. The atom is constructed by a certain amount of energy. As stated by Albert, Energy is another dimension of Mass.

The Mass of the object will vary according to the total Comprising Element's Mass. The two or more different elements form a molecular as stated in the scientific world. A Group of Similar or different Molecular can form an Object. Object's Atomic Mass is the Summation of all elements' Mass in that object or all molecules' Mass in that object. The energy of an element is equal to The Mass of an element, As stated by Einstein.

Neutron's Energy is the Primary unit of Measurement for Mass for a natural Atom (AMU).

Atomic Mass = Neutron's Energy + Electron's Energy in all Energy States + Proton's Energy + Other elementary particles Energy

1.8 Energy to Mass for Atomic Elementary Particles

Definition

As stated by Einstein, Energy can be converted to Mass in the number of Square of C or Speed of Light. He measured based on 1KG of Mass. Let try another way to convert the 1 neutron Mass or 1 AMU by multiplying the Square of C or Light of Speed.

Take as,

$$M = 1 \text{ AMU}$$

Apply the $E = MC^2$ by making the M as 1 AMU.

Take the Electron, Proton, Neutron in AMU basis.

The Kinetic Energy emitted from an elementary particle can be measured in Mass by using the Einstein's Formal, $E=MC^2$

The Bohr has mentioned as Electron in different energy state will have different energy so we should consider the energy of electron by referring to the energy states in the Atom.

Formula to Energy of Elementary Partials To Mass

- The Mass or Rest Energy of Neutron (REN):**

Neutron Mass = 1 AMU

C^2 = Square of Speed of Light

1 Neutron Mass = $1.67492749804(95) \times 10^{-27} \text{ kg}$

$$C^2 = (300000)^2$$

Therefore, $REN = (1.66054 \times 10^{-27}) * (300000^2)$

- The Mass or Rest Energy of Electron (REE):**

C^2 = Square of Speed of Light

1 Electron Mass = $9.1093837015(28) * 10^{-31} \text{ Kg}$

$C^2 = (300000)^2 + / - \text{ Energy of Energy State}$

Therefore, $REE = (9.1093837015(28) * 10^{-31} \text{ Kg}) * (300000^2) +/- \text{ Energy of Energy State}$

- The Mass or Rest Energy of Proton (REP):**

C^2 = Square of Speed of Light

Proton Mass = $1.67262192369(51) \times 10^{-27}$

$$C^2 = (300000)^2$$

Therefore,

$REP = (1.67262192369(51) * 10^{-27} \text{ Kg}) * (300000^2)$

- **The Mass or Rest Energy of W Boson:**

W Boson Mass = $80.433 \pm 0.009 \text{ GeV}/c^2$

$C^2 = (300000)^2$

W Boson Rest Energy = $80.433 \pm 0.009 \text{ GeV}/c^2 * (300000)^2$

- **The Mass or Rest Energy of Z Boson:**

Z Boson Mass = $91.1876 \pm 0.0021 \text{ GeV}/c^2$

$C^2 = (300000)^2$

Z Boson Rest Energy = $91.1876 \pm 0.0021 \text{ GeV}/c^2 * (300000)^2$

Mystery of Quantum Gravity:

All three forces except gravity are originated from Quantum/Atomic elementary particles but Gravity is the Reaction of tensor as per the theory of Einstein so till now we have not found quantum or atomic Gravity with evidence.

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