A NEW NEUTRON MODEL

Kunwar Jagdish Narain[a) b)]

(Retired Professor of Physics)

As we know, in nature, nothing occurs unnecessarily, e.g., our hearts beat persistently without having any source of infinite energy, not unnecessarily; there is an important purpose as to why they beat persistently, and they have special structure, unlike simple balloons of blood, that keeps them beating persistently and provides all the properties our hearts possess. And therefore, as neutrons possess persistent spin motion without having any source of infinite energy and several properties; there should positively be some important purpose as to why they possess persistent spin motion, and they should have special structure, unlike simple balloons of zero net charge, that keeps them spinning persistently and provides all the properties they possess. Presently, that special structure of neutrons has been determined. It enables to give very clear and complete explanation of all the properties the neutrons possess, e.g.: 1. Persistent spin motion; 2. Magnetic moment; 3. Electric dipole moment; 4. High penetrating power; 5. Distinguishable low and high energy ranges; 6. Why and how neutron has both unstable (in its free state) and stable (in nuclei) states; 7. How and what situation is created in nuclei such that the neutron becomes stable; 8. Why and how neutron decays after about 15 minutes, while the rest of all the unstable elementary particles decay within fraction of a second; 9. How, during beta decay, the beta particles, which are electrons are emitted from the nuclei while it is believed that electrons do not reside inside the nuclei; 10. Why and how beta particles, emitted from radioactive sources, have continuous energy spectrum.

[a)] kjnarain@yahoo.co.in ; kjnarain@hotmail.com

[b)] Former address: Physics Department, Govt. Bilasa Girls P.G. (Autonomous) College, Bilaspur (C.G.) 495001, INDIA

1. INTRODUCTION

As we know, in nature, nothing occurs unnecessarily, e.g., our hearts beat persistently without having any source of infinite energy, not unnecessarily; there is an important purpose as to why they beat persistently, and they have special structure, unlike simple balloons of blood, that keeps them beating persistently and provides all the properties our hearts possess. And therefore, as neutrons possess persistent spin motion without having any source of infinite energy and several properties; there should positively be some important purpose as to why they possess persistent spin motion, and they should have special structure, unlike simple balloons of zero net charge, that keeps them spinning persistently and provides all the properties they possess. Further, as we know, all the phenomena/activities related with our hearts, e.g., continuous blood circulation etc. taking place in our bodies are the effects of the purpose behind persistent beating of our hearts and their special structure, similarly, all the activities/phenomena related with neutrons taking place in their systems should be the effects of the purpose behind their persistent spin motion and their special structure.

Presently, that special structure of neutrons has been determined. (For the purpose as to why neutrons possess persistent spin motion, see Sec. 2, Ref. 1) It enables to give very clear and complete explanation of, e.g.: 1. Persistent spin motion of neutrons (see Sects. 2 and 2.1); 2. Why and how neutron decays after about 15 minutes, while the rest of all the unstable particles decay within fraction of a second (see Sec. 2); 3. Why and how neutron has both unstable (in its free state) and stable (in nuclei) states (see Sec. 2); 4. How and what situation is created in deuterons, alpha particles and nuclei such that the neutron becomes stable in them (see Sec. 2); 5. Magnetic moment of neutron (see Sec. 3.1); 6. Electric dipole moment of neutron (see Sec. 3.2); 7. How electrons are emitted from the nuclei during beta decay while it is believed that the electrons do not reside inside the nuclei (see Sec. 3.3); 8. Why and how beta particles emitted from radioactive sources have continuous energy spectrum (see Sec. 3.4)**;** 9. Why and how neutron has high penetrating power (see sec. 3.5); 10. Why and how neutron has distinguishable low and high energy ranges (see Sec. 3.6).

Currently, several neutron models, including standard quark model, have so far been proposed but yet we have no knowledge as to how neutrons possess persistent spin motion without having any source of infinite energy. And consequently, there are several very important properties of neutrons which are still unexplained. And there is hardly any knowledge available regarding the structures and properties of deuterons, alpha particles and nuclei.

The standard quark model[2,3], though explains some properties of neutron, but in this model, in order to arrive at the desired results, several such concepts have been taken those are practically and logically unbelievable. And consequently, the standard quark model gives rise to numerous very basic and fundamental questions. For example:

According to quark model[3], neutron is composed of two down quarks (d_1 and d_2), each having charge −e/3 and mass 4.1 to 5.8 MeV/c^2, and one up quark (u), having charge +2e/3 and mass 1.7 to 3.3 MeV/c^2, and thus has zero net charge. And a proton is composed of one down quark (d) and two up quarks (u_1 and u_2) and thus has +e net charge. According to this model[4], β^- particles are emitted from the neutrons as the consequence of decay of their down quarks (d_2) into up quarks (u_2), Fig. 1, and β^+ particles are emitted from protons as the consequence of decay of their up quarks into down quarks. Then protons should also be unstable as neutrons are unstable. While on the contrary, protons are stable particles, how?

Further, according to this model, when a down quark (d_2) decays into a lighter up quark (u_2), a virtual W^- boson[3] having charge[5] (-e) and mass[5] 80.398 ± 0.023 GeV/c^2 is emitted and W^- boson decays into an electron (β^-) and an antineutrino, Fig. 1. But the assumptions, e.g.: 1. Decay of quark d_2 having charge −e/3 into a quark u_2 having charge +2e/3 emitting a virtual W^- boson; 2. Emission of a virtual W^- boson; 3. Even being a virtual particle, the possession of mass (80.398 ± 0.023 GeV/c^2) by W^- boson, that too about 10^4 times more than the mass (4.1 to 5.8 MeV/c^2) of the mother quark d_2; 4. Even being a virtual particle, the possession of charge by W^- boson, that too –e while the mother quark d_2 has only charge −e/3; 5. Decay of virtual W^- boson, which does not exist physically, into a real electron β^- that exists physically; are logically and practically unbelievable. How and by which mechanism and/or according to which scientific (physical/chemical) law, do the above phenomena/events take place? As the consequence of decay of a quark d_2 into a quark u_2, the emission of a real particle of mass (4.1 to 5.8 - 1.7 to 3.3) MeV/c^2 can be assumed, or, according to mass-energy equivalence principle (theory of relativity), the emission of an energy (4.1 to 5.8 - 1.7 to 3.3) MeV can be assumed, but the occurrence of the above events is logically and practically unbelievable.

Furthermore, what are the physical interpretations of: 1. Virtual W^- boson; 2. Possession of mass and charge by virtual W^- boson; 3. Emission of a virtual W^- boson as the consequence of decay of a real quark d_2; 4. Decay of virtual W^- boson into a real electron (β^-) etc.? As far as the author's knowledge is concerned, it is believed that there exist only matter and energy in the universe, in which category does the virtual W^- boson lie?

2. PRESENT NEUTRON MODEL

A neutron is actually a combination of an electron and a proton. This combination happens to be such that it behaves as a single particle in nuclei as proton behaves in nuclei. But how, that is as follows:

In nature, when a proton and an electron are found moving along the same straight line but opposite in directions, they may front on collide with each other. But, as electrons and protons possess persistent spin motion without having any source of infinite energy, they possess special structures, unlike simple balloons of charge, that keep them spinning persistently (see Sects. 3.1.1 and 3.1.2, Ref. 1). According to their special structure, electron (and similarly proton) possesses magnetism too which occurs in the form of a ring round its ball of charge, where its ring of magnetism and the ball of charge both spin with frequencies ω_{EM} and ω_{EC} respectively (in the case of proton, with frequencies ω_{PM} and ω_{PC} respectively) but in directions opposite to each other. Due to frequencies ω_{EM} and ω_{EC}, the ring of magnetism and the ball of charge of electron obtain linear velocities v_{EM} and v_{EC} respectively along the directions of their respective spin angular momentum L_{SM} and L_{SC} according to expression[1] (1), and finally the electron obtains linear velocity v_{E} $(= \mathrm{v}_{EC} - \mathrm{v}_{EM})$ along the direction of its spin angular momentum L_S (for detail, see Sec. 3.1.1, Ref. 1). Similarly in the same fashion, proton obtains linear velocity v_P $(= \mathrm{v}_{\mathrm{PC}} - \mathrm{v}_{\mathrm{PM}})$ along the direction of its spin angular momentum L_S.

And therefore, in nature, when a proton and an electron, moving along the same straight line but opposite in directions front on collide with each other, the planes of their magnetism, magnetic fields, charges and electric fields are found in the same plane perpendicular to the directions of their velocities, and the directions of spin motion of their respective rings of magnetism (and hence of magnetic fields) and the balls charge (and hence of electric fields) lie in opposite directions. The spin motions of their balls of charge and electric fields in directions opposite of each other probably do not let their balls of charge to come in contact with each other. A very fine space is left between them. As the proton happens to be much heavier (about 2×10^3 times) than the electron, when electron collides with proton, the proton is neither being pushed behind nor it stops moving forward. It goes on moving forward in the direction of its linear motion but its velocity (v_P) is of course being reduced, say to v'_P. The electron stops moving forward and its velocity (v_E) is being reduced to zero. (After collision, how energy, momentum etc. of electron and proton conserve, see Sec. 9.2.3, Ref. 6) Then obviously, the electron is dragged along with proton in the direction of linear motion of proton.

After collision with proton, the velocity (v_E) of electron is reduced to zero, but the frequency of spin motion of its ball of charge (ω_{EC}) does not reduce to zero immediately because practically it is not possible. It reduces, but gradually. After some time say t_1, ω_{EC} is reduced as much that its v_{EC} becomes = v_{EM}. After that, as ω_{EC} decreases, v_{EM} starts becoming greater than v_{EC}, i.e. $\mathrm{v}_{EM} - \mathrm{v}_{EC}$ starts increasing. After some time say t_2, a stage comes when $\mathrm{v}_{EM} - \mathrm{v}_{EC}$ is increased as much that the electron becomes able to move in the direction of its L_{SM} with velocity greater than the velocity of proton. Then the electron may be separated from the proton even against the attractive Coulomb force on it by the proton, i.e. neutron may decay into a proton emitting an electron.

If by some means, the separation of electron from the proton is stopped, the neutron becomes stable. The same stopping of separation of electron from the proton takes place in the neutrons of all the stable systems- deuterons, alpha particles and nuclei. (How the stopping of separation of electrons takes place, see Sec. 4.1, Ref. 6.) And as strongly the stopping is done in systems, the neutrons are found to be more and more stable in those systems. Due to weak stopping in systems, e.g., in di-neutron and H^3, di-neutron does not exist in nature (see Sec. 4.3, Ref. 6) and H^3 decays into He^3 through β decay, despite E_b (binding energy per nucleon) in H^3 > E_b in He^3 (see Sec. 5.6, Ref. 6).

If the stopping does not happen to be possible, e.g. in free neutrons, the free neutrons decay into protons emitting electrons, i.e. β particles after their mean life time ($= t_1 + t_2 =$ about 15 minutes). If the stopping does not happen to be sufficiently strong, e.g. in di-neutron, H^3 and radioactive nuclei, their neutrons start decaying after their mean life time. But after decay of their neutrons, i.e. after separation of electrons (e.g. electron E_1) from the protons (e.g. proton P_1) of their neutrons (e.g. neutron N_1), during the course of motion of electron E_1 along the direction of its L_{SM}, a situation comes when ω_{EC} of electron E_1 starts increasing again. And when ω_{EC} of electron is increased as much that its v_{EC} starts becoming greater than its v_{EM} and the difference (v_{EC} - v_{EM}) is increased as much that the electron can move towards its L_{SC}, it starts moving again along its L_{SC}, i.e. towards the proton P_1 and may recombine with proton P_1 colliding with that. If the electron E_1 is ejected from its path travelled in between- after its separation from proton P_1 and before recombining with that, by some means, e.g. in radioactive nuclei (see Sec.9.2.1, Ref. 6), or there is created such situation during the course of that travelling, that the proton P_1 becomes unable to recombine with electron E_1, e.g., in di-neutron (see Sec. 4.3, Ref.) and H^3 (see Sec. 5.6, Ref.), the neutron N_1 decays finally.

2.1 How the special structure of neutrons keeps them spinning persistently

As electron, due to its $\mathrm{v_{EC}}$ and $\mathrm{v_{EM}}$ obtains $\mathrm{v_E}$ $(= \mathrm{v}_{EC}$ - $\mathrm{v}_{EM})$, and corresponding to its $\mathrm{v_E}$, it obtains ω_E according to expression[1] (1), and proton, due to its $\mathrm{v_{PC}}$ and $\mathrm{v_{PM}}$ obtains v_P $(= \mathrm{v_{PC}}$ - $\mathrm{v_{PM}})$, and corresponding to its v_P, it obtains ω_P according to expression[1] (1), similarly, as neutron is a combination of an electron and a proton, due to v_P and $\mathrm{v_E}$ the neutron obtains linear velocity $\mathrm{v_N}$ $(= \mathrm{v}_P$ - $\mathrm{v_E})$, and corresponding to its $\mathrm{v_N}$, it obtains ω_N according to expression[1] (1). The neutron spin persistently with ω_N.

3. EXPLANATION OF PROPERTIES OF NEUTRON AND RELATED SOME PHENOMENA/EVENTS

3.1 Magnetic moment of neutron

According to the existing following expression for spin magnetic moment (μ_s) of a spinning particle:

$$\mu_S = (q/2m) L_S \qquad (1)$$

where q, m, and L_S respectively are the charge, mass and spin angular momentum of the particle, the spin magnetic moment (μ_{SN}) of neutron should be = 0 because the neutron possesses charge (q) = 0. While on the contrary, neutron has spin magnetic moment μ_{SN} (= -

0.00966236×10^{-24} J/T). Currently, it is argued that neutron is not a charge less particle but has net charge = 0 and hence possesses μ_{SN}. It is true that neutron has net charge = 0, but in eqn. (1), q is the charge of the particle, and for neutron, q = 0. And hence, according to eqn. (1), μ_{SN} should be = 0. Therefore, the eqn. (1) cannot be true [for more discussion to confirm that the eqn. (1) cannot be true, see Sec. 1, Ref. 7].

The net charge of neutron = 0 and μ_{SN} = finite, not = 0, mean, neutron is a combination of two or more than two particles, each having charge and μ_S such that the resultants of their charge and μ_S give respectively q_N (charge of neutron) = 0 and μ_{SN} (spin magnetic moment of neutron) = -0.00966236×10^{-24} J/T. But which are those particles? It is possible that some people may argue that the constituent particles of neutron possess equal and opposite charge but individually they possess no μ_S. Due to spin motion of their combination, neutron obtains μ_{SN}. But this argument gives rise to the questions, e.g.: 1. Which are those particles? 2. When the net charge of the combination becomes = 0, μ_S of neutron (i.e. μ_{SN}) should be = 0 according to expression (1), how can neutron have μ_{SN}? Therefore, the above argument is ruled out.

The particles which constitute neutron are one electron and one proton (see Sec. 2). When they combining with each other and constitute a neutron, the resultant of their charges, i.e. q_E (= -e) + q_P (= +e) gives the charge of neutron q_N (= 0), and the resultant of their spin magnetic moments, i.e. μ_{SE} (= - 9.2847637×10^{-24} J/T) + μ_{SP} (= 0.01410607×10^{-24} J/T) gives the spin magnetic moment of neutron μ_{SN} (= - 9.27065768×10^{-24} J/T). But the experimental value of μ_{SN} = - 0.00966236×10^{-24} J/T. It has same sign as the presently obtained (i.e.

theoretical) value of μ_{SN} has, but in magnitude, it is much lesser (about 7×10^2) than the theoretical value (-9.27065768 $\times10^{-24}$ J/T). The reason behind it probably may be as follows:

The proton has same amount of charge (+e) as the electron has (-e), but μ_{SP} is about 2×10^3 times lesser than μ_{SE} in magnitude. This decrease might be due to having about 2×10^3 times more mass by the proton in comparison to that of electron. Since neutron too is about 2×10^3 times more massive than electron, μ_{SN} is reduced by about 7×10^2 times in magnitude. This conclusion cannot be ruled out, because we find that, as m_N (mass of neutron = 1.6749×10^{-27} Kg) is a little $> m_P$ (mass of proton = 1.6726×10^{-27} Kg), μ_{SN} is a little $< \mu_{SP}$ accordingly

3.2 Electric dipole moment of neutron

When an electron combining with a proton constitute a neutron, as their balls of charge do not merge into a single ball but, due to spin motions of electric fields of their balls of charge in directions opposite to each other, a very fine space is left between their balls of charge (see Sec. 2), an electric dipole is created within the neutron. And consequently, neutron possesses electric dipole moment.

3.3 How electrons are emitted from the nuclei during beta decay while it is believed that the electrons do not reside inside the nuclei

As in neutron, an electron and a proton combine in such a manner that this combination starts behaving like a single particle (see Sec. 2), electrons do not reside inside the nuclei independently as protons reside. When a neutron decays and its electron is separated from its proton (see Sec. 2), if this electron is ejected by some means (see Sec.

9.2.1, Ref. 6) from the nucleus, the emission of electron from the nucleus is observed, otherwise not.

3.4 Why and how beta particles emitted from radioactive sources have continuous energy spectrum

During the course of motion of electron, e.g. E_1 (of neutron N_1), after its separation from proton P_1, along the direction of its L_{SM} (see Sec. 2.1), say during time t', the energy of electron goes on varying continuously due to variation in its ω_{EC} and ω_{EM} and accordingly in v_{E}. And when ω_{EC} of the electron E_1 is increased as much that its v_{EC} starts becoming greater than its v_{EM} and the difference (v_{EC} - v_{EM}) is increased as much that the electron can move towards its L_{SC}, it starts moving again along its L_{SC}, i.e. towards the proton P_1 (see Sec. 2), during this course of time say t'' too, the energy of electron goes on varying continuously due to variation in its ω_{EC} and ω_{EM} and accordingly in v_{E}. Now, suppose if this electron is ejected from its path during the course of its time $(t' + t'')$ of travelling, the energy of the ejected electron shall depend upon when, i.e. at which instant of its travelling it was ejected. From the radioactive nuclei, since numerous electrons are ejected, they might of different instants of time $(t' + t'')$. And consequently, β particles emitted from radioactive sources have continuous energy spectrum.

3.5 Why and how neutron has high penetrating power

In order to explain why neutrons have high penetrating power, let us first take an example. We take two bullets, spherical or cylindrical, of same mass, size and substance, and to one bullet we give a conical shape at its head, i.e. front side. If these bullets are fired with the same energy on the same target from the same distance one after the other, we shall find that the depth of penetration of the bullet having conical shape at its front side is more as compared to the depth of penetration of the other bullet. In the structure of neutron, since the electron lies always in front of proton during its (proton) motion (see Sec. 2) and electron is much lighter than the proton, the size of electron shall be smaller too. Then the electron produces almost the same effect as the conical shape at the front of the bullet produces. And consequently the neutrons possess high penetrating power.

Further, since electron and proton both possess spin motion, neutron possesses motional energy M.E. [= K.E. (kinetic energy) + S.E. (spin energy}] = M.E. of proton + M.E. of electron, and motional momentum M.M. [= L.M. (linear momentum) + S.M. (spin momentum)] = M.M. of proton + M.M. of electron (for detail, see Sec. 2, Ref. 1). Due to presence of electron, since neutron possesses additional M.E. and M.M., the power of penetration of neutrons is increased.

The possession of zero net charge by neutron may also be one of the reasons behind having high penetrating power by them.

3.6 Why and how neutron has distinguishable low and high energy ranges

When electrons, e.g. electron E_1 (of neutron N_1), collides with proton P_1 and the velocity ($\mathrm{v_E}$) of electron is reduced to zero, as the frequency of spin motion of its ball of charge (ω_{EC}) does not reduce to zero immediately but reduces gradually and after time t_1, ω_{EC} is reduced as much that its v_{EC} becomes = v_{EM} (see Sec. 2), the energy of electron goes on varying continuously throughout the course of time t_1. After, when v_{EC} of electron becomes = v_{EM} , as its ω_{EC} decreases, its v_{EM} starts becoming greater than v_{EC} , i.e. v_{EM} - v_{EC} starts increasing, and during time t_2 , a stage comes when $\mathrm{v}_{EM} - \mathrm{v}_{EC}$ is increased as much that the electron becomes able to move in the direction of its L_{SM} with velocity greater than the velocity of proton and the electron may be separated from the proton (see sec. 2), the energy of electron goes on varying continuously throughout the course of time t_2 too.

If from a source of neutrons, the neutrons are emitted, they might be of different instants, during which ω_{EC} of their electrons was decreasing (i.e. during time t_1), and during which $\mathrm{v}_{EM} - \mathrm{v}_{EC}$ of their electrons had started increasing (i.e. during time t_2). The neutrons emitted during the different instants of the course of time t_1, should be of distinguishable low energy range, and emitted during the different instants of the course of time t_2 , should be of distinguishable high energy range. Because, during the course of time t_1 , as the electron opposes the motion of proton, the energy of neutron decreases, and during the course of time t_2 , as the electron supports the motion of proton, the energy of neutron increases.

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FIGURE CAPTION

Fig. 1: The Feynman diagram for β decay of a neutron into a proton, electron, and antineutrino via an intermediate W^- boson.

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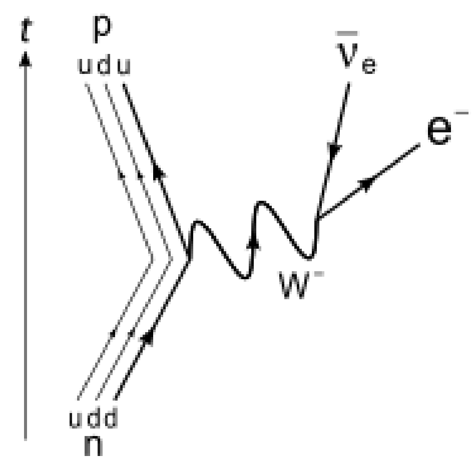

Fig. 1