A NEW QUANTUM THEORY

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In nature, nothing is said to occur without reason/purpose. For example, our hearts beat persistently without having a source of infinite energy, which does not happen without reason. The reason is due to their special structure that provides all the properties our hearts possess. In the same way, as electrons, nucleons, and all other particles, or quanta (since quantum mechanics is applied to all particles, these should be known as quanta) possess persistent spin motion without having any source of infinite energy, there should be some purpose. And the purpose should be due to their special structure that provides all the properties they display. Therefore, the purpose as to why quanta possess persistent spin motion, their special structures, and properties have been determined. The account of the effect of the purpose as to why quanta possess persistent spin motion, that is, a new quantum theory (or can say quantum spin theory) enables us to give very clear and complete explanation of all the phenomena related to them. At present, applying it, it has been tried to give explanations of: 1. Phenomena of interference and diffraction; 2- Phenomenon of spectroscopy; 3- Phenomenon of transmittance T = finite for particles possessing energy $E < V_0$, where V_0 is energy of the potential barrier; 4- Phenomenon of decrease in the rate of increase in velocity of the accelerated electrons after attaining relativistic velocity by them; 5- Phenomena of: i- acquiring elliptical orbits by the orbiting electrons, despite moving in spherically symmetric field; ii- conservation of energy, momentum, and spin angular momentum of the orbiting electrons, during their motion along elliptical orbits.

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1. INTRODUCTION

As we know, in nature, nothing occurs without reason/purpose. For example, our hearts beat persistently without having a source of infinite energy, which does not happen without reason, as there is an important reason as to why they beat persistently, in addition to why they have a special structure that keeps them beating persistently to provide all the properties our hearts possess. Therefore, as electrons, nucleons, and all other particles, or quanta (since quantum mechanics is applied to all particles, these should be known as quanta) possess persistent spin motion without having any source of infinite energy, there should be some purpose. And the purpose should be due to their special structures that provide all the properties they display. [As photons are emitted from the orbiting electrons, which possess persistent spin motion, the photons also possess spin motion that they derive from the orbiting electrons (for verification of its truth, see Sec. I A, Ref. 1).]

Further, as we know, all the phenomena/activities related to our hearts, for example, the continuous blood circulation taking place in our bodies, are the effects of the purpose behind the persistent beating of our hearts, its special structure and properties. Similarly, all the phenomena/activities related to electrons, nucleons, and so forth, should be the effects of the purpose behind their persistent spin motion, their special structures and properties.

Therefore, the purpose as to why quanta possess persistent spin motion (Sec. 2, Ref. 2), their special structures, and properties (Sec. 3, Ref. 2) have been determined. The account of the effect of the purpose as to why quanta possess persistent spin motion, that is, a new quantum theory (see Sec. 2) enables us to give very clear and complete explanations of all the phenomena related to them. At present, applying it, it has been tried to give explanations of: 1. Phenomena of interference and diffraction of photons and

electrons (see Sec. 3.1); 2- Phenomenon of spectroscopy (see Sec. 3.2); 3- Phenomenon of transmittance T = finite for particles possessing energy $E < V_0$, where V_0 is energy of the potential barrier (see Sec. 3.3); 4- Phenomenon of decrease in the rate of increase in velocity of the accelerated electrons after attaining relativistic velocity by them (see Sec. 3.4); 5- Phenomena of: i- acquiring elliptical orbits by the orbiting electrons, despite moving in spherically symmetric field (see Sec. 3.5.1); ii- conservation of energy, momentum, and spin angular momentum of the orbiting electrons, during their motion along elliptical orbits (see Sec. 3.5.2).

Currently, it has been assumed that the quanta possess wave nature, and all the phenomena related to them take place due to their dual nature (i.e. wave nature or particle nature). Their wave nature has been assumed because this alone and not the other quantum idea can account for the phenomena of interference and diffraction of electrons and photons. However, the concept of their wave nature cannot be true (for its verification, see Sec. 1.1, Ref. 3), and the phenomena of interference and diffraction of electrons and photons cannot take place due to their wave nature (for its verification, see Sec. 1.2, Ref. 3). The current quantum theory (i.e. quantum wave theory) although has huge success to its credit, but it fails to explain numerous very important phenomena. For example: i. Decrease in the rate of increase in velocity of the accelerated electrons after attaining relativistic velocity by them; ii. Despite moving in spherically symmetric field, how do the orbiting electrons acquire elliptical orbits; iii. How do the energy, momentum, spin angular momentum of the orbiting electrons conserve during their motion along their elliptical orbits. And the phenomena, to which the quantum wave theory succeeds to explain, if we examine their rigorous mathematical proofs, there we find that, in order to arrive at the desired results, numerous such assumptions have been taken, which are logically and practically unbelievable, and sometime self contradictory too. For example:

1. The energy $E_f - E_i$ [where E_f = K.E. (kinetic energy) + P.E. (potential energy) of the orbiting electron when it is excited, and E_i = K.E. + P.E. of the orbiting electron after the emission of a photon from it], which is the difference of K.E. + P.E. of the orbiting electron between its two energy states E_f and E_i, has been assumed emitted from the orbiting electron as a bundle of radiation energy $h\nu$, when the electron transits down from energy state E_f to energy state E_i.

2. To electrons, nucleons, and all other particles, the packet wave nature has been associated, while to photons, which are emitted from the orbiting electrons, instead of associating the same packet wave nature, the electromagnetic wave nature has been associated.

3. To photons, the electromagnetic wave nature has been associated, because the electromagnetic waves need no medium for their propagation, similarly, as photons need no medium for their motion, and secondly, no concept, other than the concept of wave nature of photons and electrons, can account for the phenomena of their interference and diffraction. Then: i- there should be some evidence(s) of interference and diffraction of microwaves and radio waves (which are assumed to be the electromagnetic waves), and ii- to electrons too, the electromagnetic wave nature should be associated, because electrons also need no medium for their motion. But there is no evidence of interference and diffraction of microwaves and radio waves, and to electrons, the electromagnetic wave nature has not been associated, instead the packet wave nature has been associated.

4. The illuminations of bright interference fringes and bright diffraction bands have been assumed due to wave nature of photons, but the illumination of spectral lines has not been assumed due to wave nature of photons. Because, in explanation of the phenomena of emission and absorption of light, it has been assumed that, these

phenomena take place due to particle nature of photons, not due to their wave nature. While on the other hand, the term ν, which is currently being assumed as the frequency of the wave nature of photons and is being used to express the frequency of interference fringes, the same term ν is being used to express the frequency of spectral lines.

2. PRESENT QUANTUM THEORY

As the purpose (see Sec. 2, Ref. 2), as to why quanta (i.e. electrons, nucleons, and all other particles) possess persistent spin motion, is to generate:

1. Linear velocity (v) in them along the directions of their respective L_S, which (linear velocity) varies as the frequency of their spin motion (ω) varies (for detail information, see Sec. 2.1, Ref. 2);
2. Motional energy E_M [= kinetic energy (E_K) + spin energy (E_S)] and motional momentum p_M [= linear momentum (p_{LIN}) + spin momentum (p_S)] in them (for detail information, see Sec 2.2, Ref. 2);

the quanta are always found in a state of motion, which is oriented along the directions of their respective L_S (for its verification, see Ref. 4), and during their motion, their energy, momentum, and spin angular momentum, all conserve, and always even, when the rate of increase in velocity of the accelerated electrons by a large voltage (e.g., in Bertozzi's experiment[5]) starts decreasing after attaining relativistic velocity by them, and when the electrons move along their elliptical orbits. (For detail information, see Sec 2.2, Ref. 2.)

As photons also possess spin motion (see Sec. I A, Ref. 1) and the rest mass (for verification of its truth, see Ref. 6), the spin motion of photons generate the same two properties (mentioned above), that is, linear velocity c, $E_M = h\nu$, and $p_M = h\nu/c$, in them (for detail information, see Sec. 2, Ref. 7), and they are always found in a state of motion, which is oriented along the directions of their respective L_S.

The account of the effect of the purpose as to why quanta possess spin motion (i.e. of the finding of quanta always in a state of motion, which is oriented along the directions of their respective L_S, and during their motion, always conservation of their energy, momentum etcetera) enables us to give very clear and complete explanations of all the phenomena related to them (quanta).

NOTE: Taking into account the effect of the purpose as to why quanta possess spin motion, the effort is under way to develop an expression, similar to Schrodinger equation, so that the mathematical proofs of all the phenomena may also be given.

3. APPLICATIONS OF THE PRESENT QUANTUM THEORY

At present, some of the important phenomena, as listed below, have been included in this study: 1- Phenomena of interference and diffraction (see Sec. 3.1); 2- Phenomenon of spectroscopy(see Sec. 3.2); 3- Phenomenon of transmittance T = finite for particles possessing energy $E < V_0$, where V_0 is the energy of the potential barrier (see Sec. 3.3); 4- Phenomenon of decrease in the rate of increase in the velocity of the accelerated electron after attaining relativistic velocity by it (see Sec. 3.4); 5- Phenomena of: i- acquiring the elliptical orbits by the orbiting electrons, despite moving in spherically symmetric field; ii- conservation of energy, momentum, and spin angular momentum of the orbiting electrons during their motion along elliptical orbits (see Sec. 3.5).

3.1 Explanation of the phenomena of interference and diffraction of photons

3.1.1 Explanation of how the photons are deviated and at different angles from their paths turning round the edge(s) of an obstacle

1. For the explanation of how the photons are deviated, and at different angles in geometrical shadow, see Sec. 3.1.1, Ref. 3.

2. For the explanation of how the photons are deviated, and at different angles in direction opposite to the geometrical shadow, see Sec. 3.1.2, Ref. 3.

3.1.2 Explanation of the phenomenon of interference of photons

1. For the explanation of how the bright and dark fringes are obtained when the source of light is monochromatic, see Sec. 3.2.1, Ref. 3.

2. For the explanation of how the overlapping fringes of different colours are obtained when the source of light is non-monochromatic, say of white light, see Sec. 3.2.2, Ref. 3.

3. For the Mathematical treatment of the phenomenon of interference of photons, see Sec. 3.2.3, Ref. 3.

3.1.3 Explanation of the phenomenon of diffraction of photons

3.1.3(a) Explanation of the phenomenon of diffraction of photons at straight edge

1. For the explanation of how the intensity falls off continuously and rapidly as we move into the geometrical shadow until complete darkness is reached, see Sec. 3.3.1(a), Ref. 3.

2. For the explanation of how the bright and dark bands are obtained outside the geometrical shadow, see Sec. 3.3.1(b), Ref. 3.

3. For the explanation of why and how the bright bands of continuously reducing intensity and width, as their order increases, are obtained, see Sec. 3.3.1(c), Ref. 3.

4. For the explanation of why and how after every bright band, a dark band is obtained, see Sec. 3.3.1(d), Ref. 3.

3.1.3(b) Diffraction at a narrow wire

1. For the explanation of diffraction at a narrow wire when the wire is thin, see Sec. 3.3.2(a), Ref. 3.

2. For the explanation of diffraction at a narrow wire when the wire is thick, see Sec. 3.3.2(b), Ref. 3.

3.1.3(c) Diffraction at a single slit

For the explanation of diffraction at a single slit, see Sec. 3.3.3, Ref. 3.

3.1.4 Current explanations of the above phenomena, and faults in them

Regarding deviation of photons, and at different angles from their respective paths turning round the edge(s) of the obstacle, currently (i.e. assuming wave nature of photons and electrons), it has been assumed hypothetically that the turning round the edges or round the corners of the obstacle is a characteristic of wave motion, and as the photons are the quanta of radiation energy which possesses wave nature, the photons are deviated from their paths, and at different angles turning round the edge(s) of the obstacle. While the present approach (i.e. taking account of the effects of persistent spin motions of electrons and electrons) gives very clear and complete explanation as to how the photons are deviated, and at different angles (see Sec. 3.1.1, Ref. 3). The present approach gives very clear and complete explanation also of how the photons are deviated, and at different angles in direction opposite to geometrical shadow of the obstacle (see Sec. 3.1.2, Ref. 3).

Regarding obtaining interference fringes, as the present approach gives very clear and complete explanation such that we can visualise in our imagination as to how practically the bright and dark interference fringes are obtained (see Sects. 3.2.1 and 3.2.3, Ref. 3), and how the overlapping fringes of different colours are obtained when the source of white is used (see Sec. 3.2.2, Ref. 3), the current approach (i.e. assuming the wave nature of photons) fails to do so (i.e. to visualise).

Regarding obtaining diffraction bands also, as the present approach gives very clear and complete explanation such that we can visualise in our imagination as to how practically the bright and dark diffraction bands of continuously decreasing brightness and width, as their order increases, are obtained in direction opposite to the geometrical shadow of a straight edge [see Sects. 3.3.1(b, c, d), Ref. 3], and how the intensity falls off

continuously and rapidly as we move into the geometrical shadow of the straight edge until complete darkness is reached [see Sec. 3.3.1(a), Ref. 3], the current approach (i.e. assuming the wave nature of photons) fails to do so. In the current approach, taking a logically and practically unbelievable concept of division of wave fronts into half period elements/zones, the above phenomena have been tried to explain. It succeeds to explain the variation in intensity of the diffraction bands, but fails to explain the variation of their width. Secondly and most importantly, as the radiation energy is emitted in quantised form, and not in continuous form, the wave fronts cannot be generated, and hence, there does not arise any question of their division into half period elements/zones.

3.2 Explanation of spectroscopic phenomena

3.2.1 Deduction of expressions for both frequency of spectral lines and intensity of spectral lines

1. For the deduction of an expression for frequency of spectral lines, see Sec. III E, Ref. 1.

2. For the deduction of an expression for intensity of spectral lines, see Sec. III F, Ref. 1.

3.2.2 Explanation of some of the important phenomena/events and properties

1. For the explanation how the radiation energy is emitted from the orbiting electrons in the form of bundles, which provide physical existence to photons as particles, and how those bundles obtain energy $h\nu$ that enables them to travel with velocity c, scatter electrons colliding with them in Compton scattering, and eject photoelectrons in photoelectric effect, see Sec. III B, Ref. 1.

2. For the explanation of how and why the intensity of spectral lines decreases as their frequency increases, see Sec. III H, Ref. 1.

3. For the explanation of how and why the thickness of spectral lines decreases as their order increases, see Sec. III L, Ref. 1.

4. For the explanation of how in atomic spectra, for example, of the hydrogen atom, there are found several series of spectral lines, for instance, Lyman series, Balmer series, Paschen series, and so forth, instead of a single series, see Sec. III D, Ref. 1.

3.2.3 Explanation of fine structures of spectral lines

1. For the explanation of why and how the fine structures of spectral lines are obtained, see Sects. III I and J, Ref. 1.

2. For deduction of expressions for the number of fine lines, for their frequency, and for their intensity, in the fine structures of different spectral lines, see Sec. III K, Ref. 1.

In addition to the above phenomena/events, several more phenomena/events have been studied (see all the subsections of the Sec. III, Ref. 1)

3.2.4 Current explanations of the above phenomena, and faults in them

The current theories succeed to deduce the expression for frequency of spectral lines, but fail to deduce the expression for intensity of spectral lines. The current theories fail also to explain: 1)- the decrease in intensity of spectral lines as their frequency increases; 2)- decrease in thickness of spectral lines as their order increases; 3)- how the radiation energy is emitted from the orbiting electrons in the form of bundles which provide physical existence to photons as particles, and how those bundles obtain energy $h\nu$ that enables them to travel with velocity c, scatter electrons colliding with them in Compton scattering, and eject photoelectrons in photoelectric effect; 4)- how in atomic spectra, for example, of the hydrogen atom, there are found several series of spectral lines, for instance, Lyman series, Balmer series, Paschen series, and so forth, instead of a single series.

Regarding explanation of the fine structures of spectral lines, in the current theories, there is found no explanation as to why and how the fine structures of spectral lines are obtained. The current theories somehow manage to give only the number of fine lines, that too adopting very complicated and tedious procedure of assigning number of sub-energy states corresponding to different energy states of electron, and putting some selection rules for the occurrence of transition of electron among them. Further, if we look at the procedure followed to explain the fine structures of spectral lines in different cases, we find that, these theories are not capable even to explain the exact number of fine lines. In order to explain the exact number, further interpretations have been presented [for detail information, see starting from the last paragraph, column-1, to paragraph-4, column-2 (page-66) of Sec. III M, Ref. 1].

3.3 Explanation of the phenomenon, transmittance T = finite for particles possessing energy $E < V_0$, where V_0 is energy of the potential barrier

As the electrons, nucleons, and all other particles possess energy $E_K + E_S = E_M$, the total energy E of the particles transmitting through the potential barrier should be = E_M, not = E_K. (Currently, it has been assumed that $E = E_K$.) And hence, the total energy E of the particles happens to be $> V_0$, and they transmit through the barrier, that is, T = finite is obtained.

Further, as we know, for penetration of a*ny* particle into/through a potential barrier, it is necessary that the particle should have momentum, and since the spin motion of a particle generates both spin energy (E_S) and spin momentum (p_S) in the particle, the momentum of the particle is also increased from p_{lin} to p_M ($= p_{LIN} + p_S$), in addition to increase in its energy from E_K to E_M ($= E_K + E_S$). And consequently, the particle

succeeds to penetrate into/through the barrier, and T = finite is obtained (for detail, see Sec. II, Ref. 1).

3.3.1 Current explanation of the above phenomenon, and faults in that

In the current explanation, it is claimed that the property of barrier penetration is entirely due to the wave nature of particles, and is very similar to the total internal reflection of light waves, for example, if two glass plates are placed close to each other with a film of air as medium between them, some light is transmitted from one plate to another even though the angle of incidence is greater than the critical angle. But, in this case, some light is transmitted even though the angle of incidence is greater than the critical angle, while in the case of transmittance of particles through the potential barrier, T = finite is obtained even though their energy $E < V_0$, how can these be similar? In the case of transmittance of particles, we are talking about the dependence of transmittance of the particles over their energy, while in the case of transmittance of light, we are talking about the dependence of transmittance of light over its angle of incidence, how can these be compared?

The claim that the intensity of transmitted light decreases exponentially with increase in thickness of the air film, similarly, as T decreases exponentially with increase in thickness of potential barrier (as we can in the mathematical treatment of explanation of T = finite) can of course be accepted. But it does not approve the claim that the property of barrier penetration is due to the wave nature of particles. Because:

1. Does the wave nature of particles generate momentum in them, and that increases their momentum to $p' (> p_{LIN})$ such that their energy, corresponding to their momentum p' (e.g., kinetic energy $m\mathrm{v}^2/2$ of a particle corresponding to its linear momentum $m\mathrm{v}$), is greater than the energy V_0 of the potential barrier? Otherwise, the particles cannot

penetrate through the barrier, and T = finite for them (possessing $E < V_0$) cannot be obtained.

2. To explain the phenomenon of photoelectric effect, in order that the photons may penetrate into the metals, the momentum $h\nu / c$ has been assigned to photons, while to explain T = finite for particles possessing $E < V_0$, it is claimed that this phenomenon occurs due to the wave nature of particles. It is amazing.

3. The concept of wave nature of particles is not true (for verification of its truth, see Sec. 1.1, Ref. 3).

3.4 Explanation of decrease in the rate of increase in velocity of accelerated electrons after attaining relativistic velocity by them

When an electron is accelerated by a large voltage up to $15\times10^6 V$ (Bertozzi's experiment[5]) and the rate of increase in its velocity (v) starts decreasing after attaining relativistic velocity by it, the rate of increase in frequency of spin motion (ω) of the electron starts increasing, which increases the spin energy ($\mathrm{E_S}$) and the spin momentum (p_S) of the electron such that the E_M and the p_M of the electron remain unchanged, and no violation of the laws of energy and momentum happens to be possible. The L_S of the electron also remains conserved. (How all these take place, for detail information, see Sec. 3.1, Ref. 2.)

The current expression for the moving mass of electron $m_{mov} = m_e / \sqrt{(1-\mathrm{v}^2/c^2)}$ (where v and m_e respectively are the velocity and the rest mass of the electron, and c is the velocity of light) is correct, but m_{mov} is not the moving mass of the electron. The m_{mov} is actually the effective mass m_{eff} of the electron, which is obtained as the result of the superposition of the effect of the spin motion of the electron on its m_e. And the

relativistic kinetic energy $E_K = [m_e c^2 / \sqrt{(1 - v^2 / c^2)}] - m_e c^2$ and the relativistic linear momentum $p_{LIN} = m_e v / \sqrt{(1 - v^2 / c^2)}$ of the electron are its E_M ($= m_{eff} v^2 / 2$) and p_M ($= m_{eff} v$) respectively, which are obtained as the result of the superposition of the effects of E_S and p_S of the electron on its E_K ($= m v^2 / 2$) and p_{LIN} ($= m v$) respectively. [For further information as to how these are obtained, see starting from the last but one paragraph (column-1, page-69) to the end of the second paragraph (column-2, page-70), i.e., the end of Sec. IV C, Ref. 1.]

3.4.1 Current explanation of the above phenomenon, and faults in that

Currently, it has been assumed that, as the electrons are accelerated by a large voltage, after attaining relativistic velocity by them when the rate of increase in their velocity starts decreasing, their moving mass (m_{mov}) starts increasing in accordance to expression $m_{mov} = m_e / \sqrt{(1 - v^2 / c^2)}$ in order to conserve their E_K and p_{LIN}. But this assumption cannot be true, because:

i. As the electrons possess E_M, p_M and L_S, the E_M, p_M and L_S of the electrons should be conserved. Further, since the frequency of spin motion of the electron (ω) varies as their velocity v varies (see Sec. 2.1, Ref. 2), when the rate of increase in the velocity of electrons starts decreasing after attaining relativistic velocity by them, how can the increase in m_{mov} of the electrons conserve their E_M and p_M? And how does the L_S of the electron conserve?

ii. The evidence we have from experiments proving the existence of electrons suggests an indivisible entity having definite quantities associated with it: e and m_e. Then how can m_e increase? Suppose, if it is argued that, when the rate of increase in v of the electron starts decreasing, it's moving mass increases, not it's rest mass m_e, this

argument cannot be accepted, because it gives rise to several questions. For example: What moving mass actually is? What is its physical interpretation? Further, as the name it has "moving mass", the moving mass of the electron should start decreasing when the rate of increase in its velocity starts decreasing after attaining relativistic velocity by it, while on the contrary, the moving mass of the electron starts increasing. How?

3.5 The explanation of the phenomena:

3.5.1. How the orbiting electrons, despite moving in spherically symmetric field, acquire the elliptical orbits, and their spin and orbital motions persist without having any source of infinite energy

For its explanation, see Sects. III C and D, Ref. 1.

3.5.2. How energy, momentum and spin angular momentum of the orbiting electrons conserve in their elliptical orbits

For its explanation, see Sec. 3.1, Ref. 2, and Sec. III J, Ref. 1.

3.5.3 Current explanations of the above phenomena, and faults in them

Currently, no explanation is found anywhere as to how the orbiting electrons, despite moving in spherically symmetric field, acquire the elliptical orbits, and their spin and orbital motions persist without having any source of infinite energy.

During motion of electrons along their elliptical orbits, since their velocity (v) varies, and as their velocity varies, the frequency of their spin motion also varies (see Sec. 2.1, Ref. 2), therefore, their energy, momentum and spin angular momentum, all should conserve. But currently, no explanation is found as to how the energy, momentum and spin angular momentum of the orbiting electrons conserve in their elliptical orbits.

The concept of elliptical orbits of electrons cannot be ruled out. The Bohr's theory[8] fails to explain accurately the frequency of higher order spectral lines of every series (e.g. Lyman series, Balmer series) because, in Bohr's theory, the motion of

electrons has been assumed in circular orbits. Somehow, if assuming the motion of electrons in elliptical orbits, the expression for the frequency of spectral lines is deduced, that shall explain accurately the frequency of higher order spectral lines of every series. Secondly, all the planets of our solar system move in elliptical orbits.

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