FAQs in Einstein's E=mc^2 and in the History of Science
Chapter 1

Physics and Physicists

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Part I
Q1. Why and how Galileo was prosecuted by the Inquisition?
'Galileo was prosecuted as his scientific ideas contradicted teachings of the Holy Bible. Even when arrested, Galileo became completely blind but continued his research work.'

According to the Holy Bible, Psalm 93:1, the phrase

"the [earth] is firmly established, it cannot be moved"
Further, in Ecclesiastes 1:4-6
"... the Earth abideth forever. The Sun also riseth, and the Sun goeth down and hastethto his place where he arose. The wind goeth toward the south and turneth about unto the north ".

Whereas **Galileo [1]** taught that the Sun is fixed and the Earth revolves around the Sun and published in 1632 the book *Dialogue Concerning the Two Chief World Systems*. So Galileo took a direct conflict with the Roman Catholic Church, and he was prosecuted and the book was banned by the Inquisition. The Inquisition was absolved in 1820 and ban was lifted on the book in 1835.

Arrested but honored by The States General award of Netherlands.
In June 1633, Pope Urban VIII ordered imprisonment to Galileo for indefinite period i.e. till death to 69 years old

Galileo. The *Latin* translation of the *Dialogue* is published in Strassburg (in Germany) by Matthias Bernegger in 1635. In May 1636, Louis Elsevier, a Dutch publisher, visited Galileo in Arcetri and agreed to publish the *Discourse on Two New Sciences* in Leiden. In fourth year of prison i.e. in April 1637 the States General award (Netherlands), was awarded to Galileo in recognition of his work. The award consisted of a gold chain worth 500 florins in recognition of his work.

Became completely blind
Galileo in January 1638 at age of 74 , lost vision in his left eye also and is now became totally blind. In July 1638. The *Discourse on Two New Sciences* comes off the press in Leiden in the Netherlands. Thus in the most crucial time of Galileo's life people of Netherlands helped Galileo, even more than his native Italians. In 1641 Galileo conceived of the application of the pendulum to clocks, even when he was blind. Finally, the greatest and the boldest scientist died on 8th January 1642 in Arcetri at age of 78. In the same year the brightest star in science Isaac Newton was also born.

Q 2. What was the Inquisition which prosecuted Galileo ?
It was the religious court for punishing those who preached against teachings of the Church.
The Inquisition was an institution in the Roman Catholic Church charged with the eradication of heresies. Heretic is a person who holds controversial opinions, especially one who publicly dissents from the officially accepted dogma of the Roman Catholic Church. In the Bible there is no reference of the Inquisition to deal with persons who differ in ideas.

In 1231, Pope Gregory IX published a decree has two clear aspects i.e. both soft and extreme. Firstly heretic (who does not believe in teachings of the Holy Bible) must be given a chance to change his views, to repent and respect the teachings of the Holy Bible. In case a heretic repents, confesses his guilt and promise to believe in the Holy Bible in future will be given accordingly warning, life imprisonment etc. Secondly if a heretic persists with his anti-Bible ideas, must be given capital punishment i.e. death sentence. There were different Inquisitions in different regions and different countries. The most controversal the Roman Inquisition began in 1542.

The first scientist prosecuted by Roman Inquisition was Giordano Bruno in 1600. Bruno was burnt alive for preaching that the Earth revolves around the Sun. Was this an act of the God Jesus Christ's Christianity ? Every religion becomes devilism when misinterpreted and used by people for vested interests; otherwise every religion means peace. If the religion is not peace and truth , then that religion is not religion. Then again Italian, Galieo Galilee, the boldest scientist ever walked on the Earth was the prey of the Roman Inquisition.

Q. 3 What is current status of Galileo in the Inquisition?
Now the previous decisions have been reversed by Pope John Pal II .in October 1992.
"Pope John Paul II has pardoned Galileo and admitted that the Earth revolves around the Sun".
Pope John Paul II has pardoned Galileo i.e. in 1992 i.e. after 359 years of persecution. However Galileo has pardoned all even at the time of punishment. Pope John Paul II announced that the Catholic Church erred in condemning Galileo's belief. It is an act of true Christianity, and a lesson for all other religions.

The Papal inquisition was dissolved in 1820 and Galileo's *Dialogue Concerning the Two Chief World Systems* was removed from the banned list in 1835 nearly after 200 years.

Q. 4 Newton confirmed that the Earth revolves around the Sun, in *the Principia* but why Newton was not prosecuted at all?
'There was greater degree of scientific and religious freedom in England since days of Henry VIII. (1491-1547)'

The Inquisition was never established in England. Also since time of Henry Eighth established New Church of England, independent of the Church of Rome. So in England everyone had far more religious freedom than other countries where the Inquisitions were instituted.

Thus Newton (1642-1727) and others in England worked without any religious hindrance and contributed to science. It may be one of the reasons for scientific and industrial development of England.

Q. 5 Should Newton be completely credited to the discovery of Law of Gravitation?
'No, it is absolutely unjustified if all credit is given to Newton only neglecting significant contribution of his fellow countryman Robert Hooke and initial contributions of others.'
Many scientists have initiated and contributed to the development of law gravitation and Newton was the last one who concluded this aspect taking basis of existing ideas and gave mathematical equation.
(i) Aristotle (384-322 BC) has asserted that the Earth is the centre and the Sun revolves around it.
(ii) The New Testament is written between 50-100AD and Ptolemy (85-165 AD), propagated the same idea.
(iii) Nicolas Copernicus (1473-1543), preached that the Earth revolves around the Sun but very cautiously. Thus for first time the Holy Bible was questioned scientifically but not firmly. Also Aristotle's the Earth-centric theory was also contradicted. Giordano Bruno (1548-1600**) and** Galileo Galilei (1564-1642) supported Copernican idea. Consequently Bruno was burnt alive in 1600 as punishment. According to the Papal orders there should be no blood shed in method of death, as Lord Christ was crucified causing painful death mainly due to blood shed. Hence Bruno was burnt alive and no drop of blood was shed rather blood dried in fire. But the death by burning is also not less painful. There were more deaths by this method, but here we are discussing the scientific aspects only.
(iv) Danish astronomer Tycho Brahe (1546-1601) took observations of Solar system and 700 stars. He recorded the astronomical data for the whole life.
(v) Johannes Kepler (1571-1630) a German astronomer and natural philosopher, was assistant to Danish astronomer Tycho Brahe . Kepler interpreted data collected by Tycho Brahe and gave three laws of planetary motion. The first law is the most significant as stated below.
(a) Each planet revolves around the Sun in an elliptical orbit.
It may be regarded as first indirect step towards understanding of gravitation.
(vi) **Robert Hooke** (1635 - 1703) was one of the greatest experimental scientists of the seventeenth century. English scientist Hooke has made serious perceptions about inverse square law of gravity before Newton. Robert Hook in his book written in 1674, titled *Attempt* to *prove the Motion of the Earth.* Hooke made some of the most pertinent remarks about gravitation in the book. In fact Robert Hooke wrote a letter **[2]** to Newton about the Inverse Square Law of gravity in letter dated 6 January 1679 and exchanged few more
(vii) Isaac Newton (1642-1727) who was basically an extraordinarily gifted mathematician fused or combined all existing ideas predominantly perceived by others in mathematical form. Newton may also be regarded a great scientific combatant. The doctrines of Hooke i.e. law of gravitation exists universally between all bodies and directs towards the centre., elliptical orbits are caused by gravitational force and this force is inverse square law in nature, were used by Newton.

Newton published the law of gravitation in the *Principia.* Then *Robert* Hook asked for acknowledgement or credit for his contribution for Inverse Square of Law of Gravitation, but Newton firmly denied. Thus if the contributions are judged in an unbiased way the law of gravitation must be re-christened as

Hook-Newton's law of Gravitation.
Even the contributions of the German Kepler and Danish Tycho Brahe cannot be underestimated; their contributions must shine in background. Hooke and Newton were also involved in priority dispute about the theory of light.

It is a popular story even in middle schools, that Newton perceived about the Earth's attracting power as an apple fell down in front of him. This incidence has been quoted by William Stukeley who wrote biography of Newton in 1752. Stukely quotes that he was taking tea with Newton in the garden. Then Newton recalled that it is the similar situation, when he concluded that an apple fell down as the Earth attracted it.

Q. 6 What are impacts of the Holy Bible's statement that the Sun revolves around the Earth?
The Holy Bible's preaching that the Earth revolves aroud the Sun have impacts on both science and society.

(a) The Holy Bible perceives that the human civilisation , and hence the Earth occupies the central place in the universe. Thus the Earth remains at rest (a symbol of supermacy) and it is the Sun which is the source of light, life, energy and power moves around the Earth.
(b) It is an example of scientific thinking. Those who composed *Psalm 93:1* and in *Ecclesiastes 1:4-6,* had really scientific thinking.
Was it independently enunciated by some Christian luminary (saint) or directly taken from doctrine of Aristotle (384-322 BC) ? One needs to study the complete development and origin of The New Testament (50-100AD) for

final conclusions. It could be matter of interest to theologists and scientists alike. It will reflect an impact of early christian theology on science. A scientist uses the ideas of his predecessor to give improved principle. In view of it now we teach the Sun is the centre and the Earth revolves around it, which is improved scientific vesion of previous theory given by Aristotle or the Holy Bible, or Ptolemy etc. It will be interesting to compare that what other religions say about the Earth and the Sun.

It is unscientific to refuse to listen other's arguments which come from different individuals, different regions and religious beliefs. All the religious scriptures of every belief are written by mortal human creatures not by the almighty God himself, and human beings is vunerable to errors.

(c) Further as far as role of the Inquisition is concerened if it hepled in restoring equality between individuals, strenghtening moral values and peace in states, then it is responsible for stabilising the society, which is important for development of science.

Part II

Q. 7 What is Aristotle's assertion for moving bodies?
"Without direct external force no motion is possible"
The basic principle of Aristotelian philosophy is "cause and effect". According to this force (or its influence) is cause and motion is effect. Aristotle maintained that rest is the natural state of body. Aristotelian doctrine maintained that a table would move (effect) as long as an agent moved it (cause). When force ceases to act the body stops. So it is consistent with *law of conservation of energy* i.e. one form of energy is converted into other. Thus force or its effect is required to set body in motion and maintain the motion. Aristotle's assertion wherever applicable is meant for daily life or realistic systems when resistive forces e.g. gravitational, frictional or atmospheric forces are present. In an article written in 1665 Newton also agreed with in Aristotle's concept of force and motion i.e. force is absolutely required for motion. Richard S. Westwell **[3]** has quoted Newton's perception as:

"So much force as is required to destroy any quantity of motion in a body so much is required to generate it, and so much as is required to generate it so much is also required to destroy it."

Aristotle's assertion (force is absolutely required for motion) can be experimentally justified or tested as, on ground, in water in air in space and in atoms etc. as far as possible. If higher force is applied on the body, then it travels more distance.

Q. 8 What is Jean Buridan's Impetus Law?
" *When body is pushed with some force it attains impetus and if not opposed by resistive forces, then body would uniformly move for infinite time."*
Impetus is motion maintaining property. Obviously when no force acts on body, it does not get any impetus and does not move.

Aristotle and his peripatetic followers held that motion of body was only maintained by action of continuous external force. Thus, a projectile (say a stone) moving through the air owed its continuing motion to *eddies* or *vibrations* in the surrounding medium. In the absence of a contiguous force, the body would come to rest immediately**.**

Greek philosopher Joannes Philoponus (b 564AD) first criticized Aristotle's notion and proposed that motion is maintained by some property of the body, imparted when it is set in motion **[4].** The French philosopher Rector of University of Paris Jean Buridan (1300 - 1358) named the motion-maintaining property *impetus (*something that incites; a stimulus) , asserting that motion of the body is arrested by the resistive forces. According to Buridan's remarks

> *...after leaving the arm of the thrower, the projectile would be moved by an impetus given to it by the thrower and would continue to be moved as long as the impetus remained stronger than the resistance, and would be of infinite duration were it not diminished and corrupted by a contrary force resisting it or by something inclining it to a contrary motion*

It implies that:
"When body is pushed with some force it attains impetus and then body uniformly moves for infinite time, if not opposed by resistive forces".

Thus Galileo's Law of Inertia and Newton's First Law of Motion are other forms of Buridan's Law. All the three have same mathematical basis i.e. F =ma. It is interesting to note that Galileo while formulating his law of Inertia critically analyzed Aristotle's assertion on motion of bodies. Definitely Galileo (1664-1727) developed his law by indigenous and rhetorical methods, but he did not mention at all about impetus law of Buridan (1300-1358). Buridan has also stated his Impetus critically analyzing Aristotle's assertion of moving bodies. Even now this useful work is not well recognized by scientific community with Buridan's name.

The Galileo's Inertia and Newton's First Law of Motion are exactly similar to above perception, but their essence lies in Buridan's Impetus Theory. There are absolutely convincing evidences that Galileo innovated the law of inertia from rhetorical experiments as described in his books, but Newton simply borrowed the First Law of Motion. There are no evidences that Newton ever conducted experiments in this regard.

Q. 9 What is Galileo's Law of inertia?
Practically it is same as Jean Buridan's law in slightly elaborated form. Inertia is a property of matter. It is that property of matter which opposes changes in velocity. Galileo used the law of inertia to counter Aristotelian doctrines of motion of bodies. Galileo believed that cause is 'for a moment' but effect is 'forever', which is true for hypothetical or 'never to be achieved system.'

"Without external force perpetual uniform motion is possible''

Galileo perceived law of inertia from experiments regarding inclined planes, motion on the various surfaces and also possibly from projectile motion as horizontal component of velocity of projectile remains constant. The moving body is brought to rest by the external resistive forces (frictional, gravitational and atmospheric etc.). If the resistive forces are eliminated then a body once set in motion will remain in state of uniform motion perpetually. Also if no force is applied on the body then it remains at rest. Galileo's law of Inertia primarily is based upon the fact that uniform motion is natural state of body.

Galileo also perceived and defined concept of acceleration. Thus Galileo maintained that the state of zero acceleration i.e. state of rest and uniform motion are the similar. Thus he put forth that the Earth may be stationary or moving with uniform velocity both the states are similar i.e. observations are same in both the cases. Galileo's law of inertia is

"*Every object persists in its state of rest, or uniform motion (in a straight line); unless, it is compelled to change that state, by forces impressed on it*".

Galileo provided conceptual basis to the concept of inertia, utilized it for explanation of motion of the Earth around the Sun and motion of bodies on the various surfaces. The law of inertia in linear motion was phrased on the basis of Galileo's findings by French Philosopher Rene Descartes (1596 - 1650) and followers of Galileo.

Q.10 What is mathematical basis for Jean Buridan's Impetus Law, Galileo's law of inertia or Newton First law of motion.
or
Justify that Jean Buridan's Impetus doctrine, Galileo's law of Inertia and Newton First law of motion ; Newton's Second Law of Motion are realistically the same?
"Newton's Second Law of Motion, F = ma is mathematical basis for Jean Buridan's Impetus doctrine, Galileo's law of inertia or Newton First law of motion."

It must be noted that essence of above three doctrines is the same, but only difference is that Buridan's theory there is no direct mention that if no force acts on the body then it remains in the state of rest. However it is obviously implied by the same. If no force acts on the body then it does not then it does not get any impetus (or motion maintaining property) hence remains at rest. But it implied explicitly in the statement, if a body cannot move without external force or impetus. However in Galileo's law of inertia and Newton's second law of motion is clearly stated. According to Galileo's law of Inertia

"*Every object persists in its state of rest, or uniform motion (in a straight line); unless, it is compelled to change that state, by forces impressed on it.*"

    a. A body remains in the state of rest; motive force sets body in motion. The aspects can be justified in the daily life phenomena.

Mathematical basis. According to Newton's Second Law of Motion,

F =ma = m (v-u)/t (5.1)
In case no force acts (F =0, requirement of Galileo's Law of Inertia) then
0 = m (v-u)/t or u =v which is also consistent with the case as body is at rest (u = v = 0)
initial velocity = final velocity
Or body preserves its velocity. If the body moves with uniform velocity, then u = v and if body is at rest then u = v = 0.
Thus both aspects of Galileo's Law of Inertia and Newton's First Law of motion contained in F =ma.

In the practical systems (when resistive forces are present) if body is set in motion and external force is removed then it gradually comes to rest. It indicates dominance of the resistive forces.
Newton's second law of motion is nothing but Galileo's Law of Inertia, hence second law of motion also provides mathematical basis for First law and Buridan's doctrine.

Jean Buridan's Law and F = ma
"*When body is pushed with some force it attains impetus and then body uniformly moves for infinite time, of not opposed by resistive forces*".
(a) If no force acts on body it gets no impetus and remains at rest.

Mathematical basis. According to Newton's Second Law of Motion,

F =ma = m (v-u)/t (5.1)

In case no force acts (F =0, if no force acts on body then impetus is also zero) then
0 = m (v-u)/t or u =v which is also consistent with the case as body is at rest (u = v = 0)
Thus when no force acts on body it remains at the state of rest, thus eq.(5.1) explains the concepts precisely.
(b) If body gets impetus and force is discontinued (F=0) then it moves for infinite time with uniform velocity. It can be explained as in above case.

The First Law of Motion can be deduced mathematically from F =ma. Newton's First Law of motion (1687) is exact replica or carbon copy of Galileo's Law of Inertia (1612), the law of inertia is further nothing but Buridan's doctrine (~1330). Hence all the four are exactly and essentially the same; Buridan invented it to remove the limitations of Aristotle's assertion;
Galileo invented the same with experimental observation and defined acceleration and finally Sir Isaac Newton summed up the existing ideas mathematically i.e. F =ma. Thus Buridan discovered the perception before Galileo and Newton. But Buridan is not credited properly for his pioneering contribution in the existing literature.

Q. 11 Did Newton copy Galileo's Law of Inertia or re- baptized it as Newton's First law of motion?
"*Yes, Newton has quoted Galileo's law of Inertia as his First law of Motion in the Principia in Book I*"
Obviously it is so. Newton's First Law of motion (1687) is exact replica or carbon copy of Galileo's Law of Inertia. However Newton in *the Principia* that Galileo derived, S = 1/2at^2 using the law of inertia. The credit of discovery of the law is given to one who discovers law for first time, not to one who simply re-quotes the law afterwards. Like this there will be numerous inventors of the same laws.

Newton **[5]** re-published the same law in Book I of *the Principia* on 5th July 1687 as his own original research. Whatever Newton wrote in the manuscript was published by Halley (who spent money for *the Principia*). Then whatever was published in *the Principia* regarded as Newton's original contribution, it was unsuccessfully objected by Robert Hooke that he must credit for law of gravitation.

Thus Newton quoted Galileo's Inertia law in straight way as Galileo was not alive to object the same. Newton did

not acknowledge that this work has been done by Galileo few decades before. Thus acknowledgement of work of Jean Buridan (1300 - 1358) is a far cry, who has stated the law for first time but in slightly different words but theme is essentially the same.

Newton was based upon at one of the best scientific institutions i.e. University of Cambridge, President of Royal Society, London for 24 years etc. and had the most significant and prolific posts in England. So it is unlikely to believe that Newton had no access to 13th century Impetus Theory of Jean Buridan, in case he wanted to include and acknowledge the ideas in the *Principia.* Even Newton did not acknowledge the work of Robert Hooke about inverse square law of gravitation who was alive at that time and claimed for the same. For Newton the First Law of Motion may be is like an "adopted son".

Part III
Q.12 What were reasons of dispute between Newton and Robert Hooke?
'The reasons of disputes between Newton and Robert Hooke (Professor of Geometry at Gresham College, and City Surveyor, FRS) over discoveries of The Inverse Square Law of Gravitation and the of The Theory of Light.'
These two discoveries are under priority controversy described below.

Inverse Square Law
Robert Hooke (1635 - 1703) was one of the greatest experimental scientists of the seventeenth century, have made accurate perceptions about Inverse Square Law of Gravity before Newton.
Robert Hook in his book written in 1674 titled *Attempt to prove the Motion of the Earth* Hooke made some of the most pertinent remarks about the gravitation. These remarks were made well before Newton. Or strictly speaking Newton based his law of gravitation on the conceptual basis provided by Hooke as in the following three axioms.

(1) that gravitation exists towards the centers of all bodies, and between all bodies;
(2) that all bodies will move in straight lines under their own impulse, but can be disturbed into orbits by other gravitational bodies;
(3) that gravity acts more powerfully when bodies are closer together than when further apart, but 'what these several degrees are I have not yet experimentally verified'.

The simple meaning of three headings.
These three headings basically describe the law of gravitation but without mathematical equation. Firstly, the law of gravitation acts between all bodies and acts towards the centers. The second heading applies to both linear motion and circular motion. In linear motion it implies that body moves in straight line. In circular motion it implies that heavenly body moves tangentially in the orbit, the heavenly body remains in the elliptical orbit due to centripetal force which is provided by gravitational force. This aspect is absolutely transparent. Thirdly the gravity (force of attraction between body and the Earth, body and Moon) is stronger when bodies are nearer, less when forces are apart.

Robert Hooke **[2]** was clearly much closer to a solution by 6 January 1679, when he wrote Newton about Inverse Square Law of Gravitation,
'is always in a duplicate proportion to the Distance from the Center Reciprocall', and 'as Kepler Supposes Reciprocall to the Distance'.

Newton refused to acknowledge Hooke's work who has suggested about Inverse Square of Law of Gravitation to Newton. Robert Hooke has suggested him about Inverse Square of gravitation and elliptical orbit and Newton has considered force of gravity as constant. The following paragraph has been quoted from UK based website

http://www.microscopy-uk.org.uk/mag/indexmag.html?http://www.microscopy-uk.org.uk/mag/artmar00/hooke1.html

'' Newton admitted his own drawing was wrong but 'corrected' Hooke's sketch based on his (Newton's) theory that the force of gravity was a constant (it isn't). It is important to note here that Hooke wrote again to Newton stating that he (Hooke) considered gravity to involve an inverse square law and was not constant! ……………….These records are available for inspection today.''

Newton provided a sketch of the path that the particle would follow, quite incorrectly showing it spiral towards the centre of the Earth. Hooke replied that his (Hooke's) theory of planetary motion would make the path of the

falling object an ellipse - providing a sketch to demonstrate his argument. It lead Newton to correct his own drawing.

If Newton had acknowledged Robert Hook then law of gravitation would have been called Hook-Newton's law of gravitation (even now it is now viable perception). Robert Hook must be credited with discovery of law of gravitation for his original and pioneering work before Newton.

(ii) Theory of Light
The twenty-eight year-old Robert Hooke published the Micrographia in September, 1664, which was an immediate bestseller. The Micrographia is the first book published in English , earlier publications were in the Latin Although the book is most known for foregrounding the power of the microscope, yet it describes distant planetary bodies, the wave-theory of light, and various other philosophical and scientific interests of Robert Hooke.

Newton announced his Theory of Light in 1672. Robert Hooke (Professor of Geometry at Gresham College, and City Surveyor, FRS) immediately accused Newton for stealing his work involving work with prism (light consists of seven colors) done in 1664. The careful study of the Micrographia and other documents can provide confirmatory evidences in this regard, that up to which extent Robert Hooke has described theory of light.

In 1680s Newton was involved with controversies or priority disputes with Hooke, Flamsteed, Leibniz etc. So Newton played safe and waited till death of Robert Hooke. As soon as Hooke died in 1703, Newton published 'Optiks', in 1704 peacefully, at this time he was President of the Royal Society, London. If Hooke were alive then he would have raised claim for Theory of Light as he did for Inverse Square Law of Gravitation published in the Principia. The manuscript of the book was ready much earlier but Newton intentionally delayed the publication.

Q. 13 Who spent money for the publication of the Principia? How many books and editions constitute the Principia?
For the publication of the Principia Astronomer Edmund Halley spent money from his own purse.
It is interesting to note that neither Newton nor some else spent money, only Edmund Halley did the same. The master piece the Principia became possible only due to inspiration of ace astronomer Edmund Halley, who supported Newton, morally, mentally and monetarily. The Principia is originally published in the Latin, in three editions in 1687, 1713 and 1726.
The complete name of the Principia is Philosophiae Naturalis Principia Mathematica.
In English it is called Mathematical Principles of Natural Philosophy. Currently the Latin is only used in Vatican City as official language. There are three books in the Principia.
(a) In Book I of the Principia, Newton starts with definitions and the three laws of motion now known as Newton's laws (laws of inertia, acceleration is proportional to force, action and reaction etc.).
(b) In Book II of the Principia presented Newton's new scientific philosophy which came to replace Cartesianism.
(c) In Book III of the Principia consisted of applications of his dynamics, including an explanation for tides and a theory of lunar motion.
The first edition of the Principia was published on 5 July 1687, the second Edition on 11-14 July 1713 and last edition a year before Newton's death on 31st March 1726.

Q.14 Why the references to Robert Hooke, Leibniz and Flamsteed were removed from the *Principia*?
If any scientist insisted for priority or did not agree with Newton then his references were removed by Newton in next editions of the Principia.

(i) **Robert Hooke and Gravitation**: Hooke rightly claimed the credit in law of gravitation and Newton flatly refused for the same. Hooke has given rudiments of gravitation in his book titled *Attempt* to *prove the Motion of the Earth* in 1674 and explained Inverse square law of gravitation in a letter dated 6 January 1679. When Robert Hooke insisted for credit for discovery of inverse square law. Hooke also wrote to Halley, who was bearing all expenses from his own purse for publication of the Principia but all in vain. Newton removed all the references from the Principia in next editions. It does not mean Hooke's contribution to Inverse Square law has been eliminated.
(ii) **Gottfried von Leibniz and Calculus**: Newton's greatest contemporary mathematician Gottfried von Leibniz, published Differential calculus in 1684 and Integral calculus in 1686 in journal *Acta Eruditorum.*
Newton appreciated and stated in first edition of the Principia that some results have derived by Leibniz independently. But later Newton backed out that he had written in the Principia appreciative remarks. Also Newton did not answer who wrote these remarks in the Principia. In 1726 in the third edition of the Principia

published; all references to Leibniz were removed without citing any reason.

Newton claimed that he has discovered calculus in the years 1664-1665, the year when he got bachelor's degree. But it is anyone's guess why did he not publish his work? This was the main reason of dispute between two. Newton's method of calculus was published after death of Newton, when translated in English. The symbols of integration and differentiation as we use today are given by Leibniz.

(iii) **Clash with John Flamsteed.** According to Stephen Hawking **[6]** Astronomer Royal, John Flamsteed has provided Newton much needed data for *the Principia.* Newton in 1690s, worked on the lunar theory, he again required astronomical data from Flamsteed. Due to certain reasons Flamsteed refused to make available data as early and in the way as Newton has wanted. Newton assumed a domineering and condescending attitude toward Flamsteed, just possible the success of *the Principia* may have changed Newton's attitude.

Newton got himself appointed to the governing body of the Royal Observatory.Then Newton arranged for Flamsteed's work to be seized and prepared for publication by Flamsteed's mortal enemy, Edmond Halley.

Then Flamsteed took the case to court and, in the nick of time, won a court order preventing distribution of the stolen work (seized by Newton). Newton was infuriated and sought his revenge by systematically deleting all references to Flamsteed in later editions of *the Principia.* If someone insisted for priority or did not agree with Newton then Newton removed their references from *the Principia* in the subsequent editions.

Newton's assistant Whiston had seen his rage at first hand. He wrote:-
Newton was of the most fearful, cautious and suspicious temper that I ever knew

Q. 15 Do scientists believe in God ?
Yes, true scientists believe in God?
The scientists are also simple human beings who have made all mistakes in the specific filed of knowledge to understand the same. Hence their achievements are amazing. The scientific thinking is based genuine and rational facts. Why an event happened? How an even happened? When an event happened? These are basic questions to be answered in satisfactorily with logic and reason.

For example, consider appearance of an angel or ghost or an unidentified foreign object (UFO). Also consider news program in some television channel or flight of an aeroplane from New Delhi to New York. The difference between two events is very obvious. The later category of events are clearly understood but not the former one. We know the developments of television right since days of John Logie Baird (1888-1948) of Scotland and that of aeroplane since days of Wright brothers (Orville, 1871-1948) of America. So expert scientists or engineers understand everything about these, they can improve and repair them as and when required. Hence these events are completely repeatable and are within human control.

Whereas appearance of an angel or ghost or unidentified foreign object (UFO) is quite different. We can not answer the basic questions as we do in case of television or an aeroplane. Does it mean they do not exist?. Who is final authority that they (angel or ghost or unidentified foreign object) do not exist. The real answer is that Nature is infinite. The phenomena of Nature are infinite. Human mind till date has been able to understand just fraction of infinite mysteries of nature and it will take infinitely long time to understand it completely. If just now gravitational force cease to exists, then where the Earth will fall in space? The nature is created by some mysterious supreme power? This mysterious supreme power is known as God. As scientists believe in Nature or mysterious supreme power, thus they believe in God. In case some scientists do not believe is God, it is very personal. But can such scientist or scientists(s) can answer all mysteries of nature, including death? If all the questions are scientifically answered, then we need not believe in God.

Chapter 2

Mathematical and conceptual inconsistencies in ΔL =Δmc^2 and hence ΔE =Δmc^2
Part I

Q.1 What are limitations of Einstein's $\Delta L = \Delta mc^2$ (and hence $\Delta E = \Delta mc^2$) which a layman can understand?

Q. 2 What is the main reason of limitations in Einstein's derivation of $\Delta L = \Delta mc^2$ and $\Delta E = \Delta mc^2$.

Q. 3 Is $\Delta E = \Delta mc^2$ applicable to inter-conversion of all possible energies and mass? Has $\Delta E = \Delta mc^2$ been confirmed for all energies ?

Q.4 Can $\Delta E = \Delta mc^2$ be wrong in some cases of conversion of energies to mass?

Q.5 If $\Delta E = \Delta mc^2$ not confirmed in all cases then why it is regarded as true in all possible cases?
Part II

Q.6 How does Einstein's derivation $\Delta L = \Delta mc^2$ contradict law of conservation of matter?

Q.7 How does Einstein's derivation predict that when light energy is emitted by body then its mass INCREASES?

Q.8 How does Einstein's derivation predict that when light energy is emitted its mass remains the same ?

Q. 9 How does Einstein's derivation predict that when light energy is emitted its mass DECREASES more than $\Delta m = \Delta L/c^2$?
Part III
Q.10 What are limitations of central equation used in Einstein's derivation?

Q.11 How in Einstein's derivation of mass energy inter-conversion is made or marred by application of Binomial Theorem?
Q.12 Who suggested $\Delta E = \Delta mc2$ first of all ?

Q.13 What is contribution of Samuel Tolver Preston ?

Q.14 Italian Olinto De Pretto speculated $\Delta E = \Delta mc^2$ in its precise form in 1903-04. While Einstein derived the same. Which of three must get the credit of discovery of $\Delta E = \Delta mc^2$?
Part III

Q.15 The concepts Einstein discussed in June 1905 and paper existed earlier also. So what is

Einstein's contribution?
Q.16 Is $\Delta E = \Delta mc2$ is result of Special Theory of Relativity?

Q.17 What is Einstein's Special Theory Relativity ?

Explanations to above questions

Part I
Q.1 What are limitations of Einstein's ΔL = Δmc² (and hence ΔE = Δmc²) which a layman can understand?

No equation can have bigger limitations than those possessed by Einstein's derivation of ΔL = Δmc².

The simple limitations of Einstein's light energy –mass equation can be understood as below.
Consider that a body of mass 10 gm is emitting light energy then its mass will change as

(i) the mass of body (originally 10gm) must decrease and should become 8 gm
i.e. mass is converted into energy. This conclusion is correct.
(ii) the mass of body (originally 10gm) must increase to 12 gm
i.e. energy is also being emitted and mass is increasing. It is experimental CONTRADICTION.
(iii) the of body (originally 10gm) must remain the same 10gm
i.e. energy is also being emitted and remains the same.
Now out of three possibilities, the first one is correct i.e. when body emits energy its mass also decreases i.e. mass is converted into energy. It is again experimental CONTRADICTION.
(iv) the mass of body (originally 10gm) must decrease and should become 7gm or 9 gm

But is contradictory to Einstein first deduction mentioned above. Thus Einstein's derivation also possesses self-contradictory deductions.

The second possibility, that when light energy is emitted mass also increases is clear contradiction and violation of law of conservation of mass and energy. There can be no bigger limitation bigger than this for any equation. The third possibility means that when light energy is emitted its mass remains the same. It implies that light energy is being created out of nothing. It is again contradiction of law of conservation of mass and energy.

Q. 2 What is the main reason of limitations in Einstein's derivation of $\Delta L = \Delta mc^2$ and $\Delta E = \Delta mc^2$.

The main reason for limitations of Einstein's derivation involves FOUR variables and Einstein simply took handpicked values of parameters to obtain $\Delta L = \Delta mc^2$. If values of parameters are taken in general or scientific way then LAW of CONSERVATION of MATTER is violated.

The main reason for limitations (or contradictory predictions) for Einstein's derivation is that it involves a large number of parameters. In eq. (5.2) there are FOUR variables e.g. *l* magnitude of light energy, number of waves emitted, angle ϕ at which light energy is emitted and velocity v. The equation $\Delta L = \Delta mc^2$ and obtained only under special conditions or handpicked variables, which is not scientifically justified for such significant derivation. $\Delta L = \Delta mc^2$ is based upon the following equation [7,8],

$l^* = l\,[\,1\text{-}v/c\,\cos\phi\,]\,/\,[\,(1\text{-}v^2/c^2)^{1/2}]$ (5.2)

Now it must be carefully noted that Einstein derived

$\Delta m = \Delta L/c^2$ (5.3)

for particular set of parameters. For example values of magnitude of light energy (0.5 L , 0.5L), number of light waves (two), angles made by light waves (ϕ and ϕ +180) and velocity v is such that v<<c .

For complete analysis all possible values of parameters to be considered logically. If various permissible values of parameters are considered, then light energy is emitted and contradictory results are obtained. This aspect is completely neglected by Einstein and other critics of the work. For example when light energy is emitted by body then its mass decreases, increases or remains the same. The predictions from Einstein's derivation contradict the law of conservation of energy as explained above. The law of conservation of energy is contradicted and hence there can be no bigger contradictions than this.

Q. 3 Is $\Delta E = \Delta mc^2$ applicable to inter-conversion of all possible energies and mass? Has $\Delta E = \Delta mc^2$ been confirmed for all energies?

Yes, $\Delta E = \Delta mc^2$ is applicable to all energies e.g. light energy, heat energy, chemical energy, nuclear energy, magnetic energy, electrical energy, sound energy, energy emitted in form of invisible radiations energy emitted in cosmological and astrophysical reactions etc. It has not been confirmed for all energies yet [9-11] including chemical reactions.

In Sep 1905 paper Einstein initially derived equation for light energy emitted and mass annihilated as $\Delta L = \Delta mc^2$. Then without giving any mathematical proof (in speculative way) he generalized the same to $\Delta E = \Delta mc^2$, for every energy in nature. $\Delta E = \Delta mc^2$ is applicable *to all energies available in nature*. Thus all energies can be converted to mass and mass can be converted to all energies. Here mass is same but the energies are of different types. The various types of energies are light energy, heat energy, chemical energy, nuclear energy, magnetic energy, electrical energy, sound energy, energy emitted in form of invisible radiations, energy emitted in cosmological and astrophysical reactions etc.

$\Delta E = \Delta mc^2$ *is applicable to all these energies*. Thus all types of energies as cited above. The conversion factor is c^2 in all cases. $\Delta E = \Delta mc^2$ *has not been confirmed for all these energies.* Further inter-conversion of mass and energy are the most mysterious reactions in nature and in each case it is required to be experimentally confirmed specifically. For each case different techniques are required to be developed.

When radiant energy (gamma ray photon) passes near the field of nucleus, it changes to electron (9.1×10^{-31} kg)

and positron (9.1×10^{-31} kg). For example characteristic conditions for conversion of chemical energy to mass are different from those for conversion of electrical energy to mass. Further characteristic conditions for conversion of sound energy to mass are different than taking p$_{lace}$ at heavenly bodies. According to $\Delta E = \Delta mc^2$ conversion factor in all cases is the same i.e. c^2. It implies that theoretically there is no difference between conversions of various energies to mass. But experimentally it is never so, as interconversion of mass and energy are diverse and numerous processes. It is not feasible for a single equation to interpret such diverse phenomena or until $\Delta E = \Delta mc^2$ is specifically confirmed in all cases.

$\Delta E = \Delta mc^2$ is confirmed in nuclear reactions only. But there are some anomalies as well, which need to be explained. In nuclear and particle physics it is regarded as reference or standard or an idol, as there are SEVEN days in week not TEN and there are TWELVE months in years not TEN. But nuclear reactions only constitute a fractional part of reactions which emit energy specifically and quantitatively. Thus $\Delta E = \Delta mc^2$ is required to be confirmed for numerous other cases also. Some deviations in nuclear reactions are also stated in the existing literature. Thus $\Delta E = \Delta mc^2$ must be confirmed specifically and separately in each and every reaction, only then it can be regarded as true in all cases.

Q.4 Can $\Delta E = \Delta mc^2$ be wrong in some cases of conversion of energies to mass?

Yes, $\Delta E = \Delta mc^2$ can be wrong in some conversion processes due to inherent characteristics of reactions; it has not been confirmed in many processes. So it is not scientific to regard $\Delta E = \Delta mc^2$ correct without experiments in all cases.

The interconversion of mass to energy or vice-versa mysterious and numerous processes or reactions and unstudied as well. Each reaction involves different characteristics. According to $\Delta E = \Delta mc^2$ conversion factor in all cases the same i.e. c^2. It implies that theoretically there is no difference between conversions of various energies to mass or mass to various forms of energies. For example characteristic conditions for conversion of chemical energy to mass are different from those for conversion of electrical energy to mass. The characteristic conditions of these two reactions are different compared to those of nuclear reactions or conversion of sound energy to mass.

As experimentally the inherent characteristics of conversion of various energies (conversion of electrical energy to mass or chemical energy to mass or sound energy to mass) to mass are different, hence conversion factor must be different. This conclusion is feasible as $\Delta E = \Delta mc^2$ is not specifically confirmed in numerous cases.

In view of it in some cases of conversion of energy to mass, $\Delta E = \Delta mc^2$ can be inconsistent in some experiments. It has to be confirmed in all cases separately where interconversion of mass to energy takes places.

Till date it is confirmed in case of nuclear reactions, but not in many other cases. The experiments once conducted over wide range of parameters, will decide the issue finally. Unless it is justified in all types of reactions e.g. light energy, heat energy, chemical energy, nuclear energy, magnetic energy, electrical energy, sound energy, energy emitted in form of invisible radiations energy emitted in cosmological and astrophysical reactions etc. it must not be regarded as true. Thus $\Delta E = \Delta mc^2$ is required to be confirmed for each reaction individually in each case.

Q.5 If $\Delta E = \Delta mc^2$ not confirmed in all cases then why it is regarded as true in all possible cases?

Due to lack of critical analysis of $\Delta E = \Delta mc^2$ only.

$\Delta E = \Delta mc^2$ regarded as true in all cases without experimental confirmation which is unscientific.

As it is confirmed in nuclear reactions only, but there are also some exceptions. It must be added that in all other processes say in chemical reactions, $\Delta E = \Delta mc^2$ has not been confirmed due experimental limitations. Till date in each and every process (in which inter-conversion of mass and energy takes places) it is not confirmed. $\Delta E =$

Δmc^2 should not be regarded as true. The possibilities of experimental violation of $\Delta E = \Delta mc^2$ can not be denied, it is also supported by theoretical analysis. Until $\Delta E = \Delta mc^2$ is not experimentally confirmed in all cases hence, it must be stated.

"Due to experimental sophistications and technicalities $\Delta E = \Delta mc^2$ is not confirmed yet in all mass-energy inter-conversion reactions. Final conclusions can not be drawn until $\Delta E = \Delta mc^2$ is experimentally confirmed in specific experiments."

Part II
Q.6 How does Einstein's derivation $\Delta L = \Delta mc^2$ contradict law of conservation of matter?

The derivation contradicts law of conservation of matter as leads to incorrect conclusions. For example, when light energy is emitted mass of body INCREASES and mass of body REMAINS the SAME.

In simple words it implies that if a body of mass 10gm is emitting light energy then its mass may become 12gm after some time; which is incorrect conclusion from Einstein derivation for ever.

Firstly let us understand the meaning of $\Delta L = \Delta mc^2$, where ΔL is light energy emitted, Δm is mass annihilated and c is speed of light. This equation implies that
"When light energy is emitted mass of body decreases i.e. mass is converted into light energy or vice-versa."
Mathematically, $\Delta m = \Delta L/c^2$

Reasons for contradiction of conservation laws.
$\Delta L = \Delta mc^2$ is based upon equation **[7-8]** ,

$l^* = l\,[\,1-v/c\,\cos\phi\,]\,/\,[\,(1-v^2/c^2)^{1/2}]$ (5.2)

In this eq.(5.2) there are FOUR variable e.g. l magnitude of light energy, number of waves emitted, angle ϕ at which light energy is emitted and velocity v. These variable puts severe constraints on derivation of $\Delta L = \Delta mc^2$

Now it must be carefully noted that Einstein derived

$\Delta m = \Delta L/c^2$ (5.3)

for particular set of parameters. For example Einstein considered two light waves having equal magnitude of energy (0.5L each) forming angles ϕ and $\phi +180^\circ$ and velocity v is such that v<<c .

Einstein simply took above values of parameters to derive the equation. If these values are not considered, then results are contradictory in nature as discussed below.

$m_b - m_a = 0.4L/vc + L/c^2$ (5.4)
$m_b - m_a = -0.6L/cv + L/c^2$ (5.5)
$m_b - m_a = 0$ (5.6)

Theses equations contradict law of conservation of matter. Further this aspect is explained in Q.7 and Q.9

Q.7 How does Einstein's derivation predict that when light energy is emitted by body then its mass INCREASES ?
The derivation so predicts when some parameters are slightly changed then derivation gives equation

$\Delta m = -\ 0.0000381\ L/cv + L/c^2$ *(5.7)*

which implies when energy is emitted mass of the body increases.

The theme of discussion is that slight variation in parameters used by Einstein, leads to entirely different results. If we just decrease the angle from 180 ° to 179.5 ° i.e. through 0.5 ° then CONTRADICTIONS to experimental results are observed. In this case Einstein's derivation predicts that *as the body emits light energy its mass increases.*

All these aspects can be understood as below logically and mathematically.

The energy of body, H_0 with respect to system (X,Y,Z) before emission is sum of two terms i.e. energy of body after emission (H_1) and energy emitted by body (L). The general equation for energy H_0 , as considered by Einstein is given by

$$H_0 = H_1 + 0.5\ L\ [1\text{-v/c cos}\ \phi\ ]\ /\ (1-v^2/c^2)^{1/2} + 0.5L\ (\ 1+v/c\ \cos\ \phi\ )\ /(1-v^2/c^2)^{1/2}\ (5.8)$$

In the present case angles at which light energy is emitted are given by 0 ° and 179.5 °. Consequently above eq. (5.8) becomes,

$H_o = H_1 + 0.5\ \beta\ L\ (1 - v/c\ \cos\ 0\ ^\circ) + 0.5\ \beta\ L\ (1-v/c\ \cos\ 179.5\ ^\circ)$
$H_o = H_1 + 0.5\beta\ L\ (1 - v/c\ ) + 0.5\ \beta\ L\ (\ 1+0.9999619\ v/c\ )$

$H_o = H_{1\ +}\ 0.5\ \beta\ L - 0.5\beta\ Lv/c\ _+\ 0.5\ \beta L + 0.49998095 L\beta\ v/c$
$H_o = H_{1\ +}\ \beta\ L\ \text{-}0.00001905\ L\beta\ v/c$

$H_o = H_1 + \beta\ L\ (1-0.00001905\ v/c)\ (5.9)$

Then energy of body, E_0 with respect to system (x,y,z) before emission is sum of two terms i.e. energy of body after emission (E_1) and energy emitted by body (L).

$E_0 = E_1 + L\ (5.10)$

Subtracting eq.(5.10) from eq.(5.9)
$(H_o - E_0) - (H_1 - E_1) = L\ [\beta\ (\ 1-0.00001905)]$
$K_o - K = -\ 0.00001905Lv/c + Lv^2/2c^2$
$[m_b - m_a]v^2/2 = -\ 0.00001905\ Lv/c + Lv^2/2c^2$
$m_b - m_a = \Delta\ m = -\ 0.0000381\ L\ /\ cv + L/c^2\ (5.11)$
$\Delta\ m = -\ 0.0000381\ L/cv + L/c^2$
or $m_a = 0.0000381L/cv - L/c^2 + m_b$

Now the quantity

$0.0000381L/cv - L/c^2$

is always positive as velocity is in classical region, it is Einstein's own condition (v<<c) on the derivation. If

velocity is not in classical region then Binomial Theorem is not applicable, hence equation is not applicable and also not obtained. Thus above equation becomes m_a (mass of body after emission of light energy)

= small positive quantity + m_b (mass of body before emission) (5.12)

which implies mass of body increases when light energy is emitted. If angle ϕ =179.5 °, thus difference in 0.5° of angle means serious contradictions. Earlier Einstein has considered if angle ϕ is 180 ° then mass of body decreases on emission of light energy.

%age error = {L/c^2 – (– 0.0000381 L/cv + L/c^2) }x100 / L/c^2
= 0.00381c/v (5.13)

The velocity v is in classical region, let it be is 10m/s, then

%age error = 1.143×10^5 (5.13)

This is tremendous value of %age error , when the angle of one wave as considered by Einstein is varied. These are the clear contradiction of law of conservation laws.

It implies that when body emits luminous energy then

    i.   energy is created
    ii. (ii) mass is also created.

How does this double increase happen? This increase in mass and energy is out of nothing. Thus law of conservation of matter is violated. Incidentally Einstein has called his theory of Static Universe with introduction of Cosmological Constant as the biggest blunder of his life as quoted by Gamow in his autobiography **[12].** But the similar or far more serious eventuality is also here, when Einstein's derivation predicts that mass and energy are simultaneously created out of nothing.

Q.8 How does Einstein's derivation predict that when light energy is emitted its mass remains the same?

The derivation so predicts when some parameters are slightly changed and equation is

Δ m = 0 or m_b –m_a = 0

Mass before emission of light wave = Mass after the emission of light wave.
For understanding this we have to repeat Einstein's derivation under the conditions when body is at rest. When body is at rest, v =0, then eq.(5.1)

$l^* = l$ [1- v/c cosϕ] / $(1-v^2/c^2)^{1/2}$ becomes
$l^* = l$

Then energy of body, H_o with respect to system (X,Y,Z) before emission is sum of two terms i.e. energy of body after emission (H_1) and energy emitted by body (L). The general equation for energy H_0 is given by

H_0 =H_1 + L/2 + L/2 = H_1 + L (5.14)

Then energy of body, E_o with respect to system (x,y,z) before emission is sum of two terms i.e. energy of body after emission (E_1) and energy emitted by body (L).

$E_0 = E_1 + L$ (5.10)

Now subtracting eq.(5.10) from eq.(5.14)

Or $(H_o - E_o) - (H_1 - E_1) = 0$

As in previous cases in terms of kinetic energy,

Or $K_o - K = 0$
$m_b v^2 /2 - m_a v^2 /2 = 0$

$\Delta m (m_b - m_a) = 0$

Or Mass of body before emission (m_b) = Mass of body after emission (m_a) (5.6)

Contradiction

Thus when system (X,Y,Z) is at rest and luminous body emits energy (say, hefty amount but finite in magnitude), in system (x, y, z) then its mass remains constant i.e. energy is being emitted out of nothing,. Thus the contradictory and self –contradictory results are the common features of Einstein's derivation, due to involvement of various parameters in the derivation.
Experimentally it is never observed that body at rest emits luminous energy in stocky amount and mass remains the same. It contradicts Einstein's previous conclusion that when light energy is emitted the mass of body decreases. It is not only experimental contradiction but also a self contradiction of the derivation.

If we consider that body is emitting light energy and its mass remains the same it is violation of law of conservation of energy. Energy can not be created out of nothing; either it is transferred from one form to other or created from the mass. In this case it is neither transferred from its other form nor is created from mass. Hence there is clear contradiction of the law conservation of energy. This is the serious limitation of Einstein's derivation of $\Delta L = \Delta mc^2$ but unnoticed by the scientific community.

Q. 9 How does Einstein's derivation predict that when light energy is emitted its mass DECREASES more than $\Delta m = \Delta L/c^2$?

The derivation so predicts when some parameters are slightly changed and equation is

$\Delta m = 0.134L/vc + L / c^2$

which implies that decrease in mass is more than $\Delta m = L / c^2$
This derivation can be obtained as illustrated below.

Thus consider the equally feasible case that two light waves are emitted having energy 0.5L and 0.5L in system (x,y,z) in the following way.

   a. The luminous body emits light wave of energy 0.5L along x-axis such that angle between x-axis and light wave is 30^0.

   b. The second wave emitted by the same luminous body of energy 0.5L is emitted exactly in opposite direction. Thus, it makes angle with x-axis 180^0.

If E_0, is the value of energy in the system (x,y,z) before emission then it has been already written as,

$E_0 = E_1 + 0.5L + 0.5L = E_1 + L$ (5.9)

In this case energy H_0 of body relative to system [X,Y,Z] moving with velocity v relative to system [x,y,z] is

$H_0 = H_1 + 0.5 \beta L (1-v/c \cos 30^0) + 0.5 \beta L (1+v/c \cos 180^0)$
$H_0 = H_1 + 0.5 \beta L (1-0.866v/c) + 0.5 \beta L (1+v/c)$

$H_0 = H_1 + \beta L (1+0.067 v/c)$ (5.15)

Subtracting eq.(5.9) from eq.(5.15)

$(H_o - E_0) - (H_1 - E_1) = \beta L (1+0.067v/c) - L$

$= L [0.067v/c + v^2/2c^2]$
$K_0 - K = L [0.067 v/c + v^2/2c^2]$
$m_b v^2 /2 - m_a v^2 /2 = L [0.067v/c + v^2/2c^2]$

or $m_b - m_a = 0.134L/vc + L / c^2$ (5.16)

Thus eq. (5.16) clearly implies that when a luminous body emits light energy then its mass increases but the increase in mass of the body is more than predictions of Einstein. Here energy emitted is same as in case of eq. (5.3). As according to Einstein's estimate increase in mass is

$m_b - m_a = L/c^2$ (5.3)

The percentage difference between eq.(5.16) and eq.(5.3)
Magnitude of %age error = Difference in value x100 / True value

$= 13.4c/v = 4.02 \times 10^9/v$ (5.17)

If the velocity is 10m/s or 36 km/hr then,
Magnitude of %age error $= 4.02 \times 10^9/v = 4.02 \times 10^8$ (5.18)

which is too large. Hence small change in angle causes an error compared to Einstein's results of exceptionally high orders.
Such limitations are unnoticed by scientific community.

Part III
Q.10 What are limitations of central equation used in Einstein's derivation?
Under certain conditions it is not consistent with the principle of dimensional homogeneity and does not obey the algebraic identity $a^2 - b^2 = (a+b) (a-b)$.
The eq. (5.2) has mainly two limitations i.e. under some conditions it does not obey law of dimensional homogeneity and does not comply with of identity $a^2 - b^2 = (a+b) (a-b)$.

i. Inconsistency of **dimensional homogeneity** when velocity v approaches to c i.e. v→c,
In eq. (5.2) ϕ is the angle which emitted wave makes with x-axis. If $\phi = 0^0$, then

$\ell^* = \ell (1 - v/c) / \sqrt{(1 - v^2 /c^2)}$ (5.19)

If the system [X,Y, Z] moves with velocity equal to that of light which realistically or actually means that velocity v tends to c i.e. v → c. (some Quasars or other heavenly bodies may attain such high velocities) .Thus eq.(5.19)

becomes

$\ell^* \to 0/0$ [from unsolved eq.(5.19)]

which is undefined or ℓ^* tends to 0/0 which has the same meaning.

The dimensions of LHS are $M\,L^2\,T^{-2}$ [energy] and that of RHS undefined. It is the inherent requirement that an equation must obey the principle of dimensional homogeneity **[13-14]** i.e. dimensions of LHS and RHS are the same, but it is not so in case of eq.(5.2) under this particular condition. Hence under this condition the central equation which leads to $\Delta m = L/c^2$ is not applicable. Such central equation which leads to such a basic principle should be free from the limitations.

(ii) **Non-compliance** of identity $a^2 - b^2 = (a+b)\,(a-b)$ by eq.(5.19).
Further contradictory results are also self-evident if eq.(5.19) is solved and same condition ($v = c$ or $v \to c$) is applied i.e. $\{1 - v^2/c^2\} = (1 - v/c)\,(1 + v/c)$ is simple algebraic result.
When eq.(5.19) is solved with above algebraic identity we get

$\ell^* = \ell\,\sqrt{(1 - v/c)}\,/\,\sqrt{(1 + v/c)}$ (5.20)

Now again if we apply the same condition the velocity v tends to c i.e. $v \to c$ above equation becomes,

$\ell^* \to 0$ [from solved form of eq.(5.20)]

Thus the same equation (in unsolved and solved forms) under similar conditions ($v \to c$) gives different results ($\ell^* \to 0/0$ and $\ell^* \to 0$), which is purely arbitrary and illogical.

Thus results from eq.(5.2) are contradictory to basic identity of algebra; and in addition the result is not consistent with dimensional homogeneity. Hence eq. (5.2) is very inconsistent in itself. Thus it is obvious that when derivation is based upon this equation, then results are bound to be contradictory in nature.

The basic principle of conservation of mass and energy should not be based upon an equation which is full of limitations e.g. it disobeys dimensional homogeneity and basic algebraic identity. Thus eq.(5.2) is relativistic in nature but its numerator varies with ϕ , even when velocity is constant or even velocity is in classical region. The relativistic effects are observable when velocity v is in relativistic region, v~c. It makes it different from other relativistic equations of variations of mass with velocity, time dilation and length contractions etc., in these equations magnitudes vary with velocity only. The variation in magnitude of numerator with angle ϕ may be a factor for inconsistent results. Similarly results can be discussed for other angles as well.

Q.11 How in Einstein's derivation of mass energy inter-conversion is made or marred by application of Binomial Theorem?
If Binomial Theorem is applied at final stage (as done by Einstein) then result is $\Delta m = L/c^2$ and when Binomial Theorem is applied initial stage then $\Delta m = 0$. It is unjustified.

Einstein started with eq.(5.2) to which Binomial Theorem was applicable,

   i.   Einstein applied Binomial Theorem at end stage and obtained equation

   $\Delta m = L/c^2$ (5.3)

   ii. Binomial Theorem is also applicable to the first equation in the initial stage then result is

   $\Delta m = 0$ (5.6)

It can be easily justified , applying Binomial Theorem to eq.(5.2) at initial stage.

$. \ell^* = \ell (1 - v/c \cos\phi) / (1 - v^2/c^2)^{1/2} = \ell (1 - v/c \cos\phi) (1 - v^2/c^2)^{-1/2}$

$= \ell (1 - v/c \cos\phi)(1 + v^2/2c^2 - 3/8\ v^4/c^4 + \ldots\ldots\ldots)$

Here $v/c << 1$, hence v^2/c^2 and higher terms can be neglected. Thus

$\ell^* = \ell (1 - v/c \cos\phi)$ (5.21)

Then energy of body, H_0 with respect to system (X,Y,Z) before emission is sum of two terms i.e. energy of body after emission (H_1) and energy emitted by body (L). The general equation for energy H_0 , as considered by Einstein in his 27 Sep. 1905 derivation is is given by

$H_0 = H_1 + 0.5\ L\ [1 - v/c \cos \phi] / (1 - v^2/c^2)^{1/2} + 0.5L\ (1 + v/c \cos \phi) / (1 - v^2/c^2)^{1/2}]$ (5.22)

Now the equation for H_0 analogous to eq.(5.22) with help of eq.(5.21) becomes (the energy of light waves and angles at which energy is emitted is same as that in Einstein's case).

$H_0 = H_1 + 0.5\ L\ [1 - v/c \cos \phi] + 0.5L\ (1 + v/c \cos \phi)$ (5.23)
$H_0 = H_1 + L$ (5.14)

The energy of body, E_0 with respect to system (x,y,z) before emission is sum of two terms i.e. energy of body after emission (E_1) and energy emitted by body (L).

$E_0 = E_1 + L$ (5.10)

Subtracting eq.(5.10) from eq.(5.14)

Or $(H_0 - E_0) - (H_1 - E_1) = 0$

Or $K_b - K_a = 0$
$M_b v^2/2 - M_a v^2 /2 = 0$

Mass of body before emission (M_b) = Mass of body after emission (M_a) (5.6)

The eq.(5.6) implies that body emits light energy, then its mass remains the same. It means that energy is emitted by body out of nothing.

It is again the CONTRADICTION of law of conservation of mass and energy and further it is self contradiction to eq.(5.2).

Earlier in Einstein's derivation (when Binomial Theorem is applied at the end stage) has predicted when light energy is emitted the mass of body decreases i.e. the mass is converted into light energy. But under this case (when Binomial Theorem is applied in the beginning) the same derivation predicts that when light energy is emitted, the mass of body remains the same.

However, the law of conservation of mass-energy holds good under all conditions and must not depend upon the stage at which Binomial Theorem (a mathematical tool) is applied. As Binomial Theorem is

applicable at both the stages, thus results must be same. Thus to get the desired results, Einstein arbitrarily applied Binomial Theorem at particular stage, which is completely unscientific. In case Binomial Theorem is applicable to both stages, then it must be applied obviously to initial stage first as it will reduce calculations. The simplicity is the global preference in all walks of life.

Exactly similar is situation of relativistic form of kinetic energy i.e. $(KE)_{rel} = (M_{rel} - M_{rest})c^2$, in which Binomial Theorem is not applicable at both the stages i.e. initial and final. We may apply Binomial Theorem at any stages the result is classical form of kinetic energy, $M_{rest}v^2/2$. Hence this equation has not limitation as $L = \Delta m\, c^2$.

Part IV

Q.12 Who suggested $\Delta E = \Delta mc^2$ first of all ?
Italian Olinto De Pretto speculated $\Delta E = \Delta mc^2$ in its precise form in 1903-04 and his paper was published **[15]** in

De Pretto, O. (1904), "Ipotesi dell'etere nella vita dell'universo", Reale Istituto Veneto

di Scienze, Lettere ed Arti, Feb. 1904, tomo LXIII, parte II, pp. 439-500

Thus De Pretto published $\Delta E = \Delta mc^2$ well ahead of Einstein. Then in Sep 1905 paper Einstein simply mathematically derived the existing equation at that time. But Einstein did not give any reference to Pretto's work.

Q.13 What is contribution of Samuel Tolver Preston ?
English scientist S T Preston in 1875. quoted some examples in which he appeared to apply that energy emitted is proportional to $\Delta E \propto \Delta mc^2$
English scientist S T Preston in his book **[16]** *Physics of the Ether* in 1875 even before birth of Einstein (1879) quoted three examples in which he applied equation $\Delta E \propto \Delta mc^2$ (proportionality form) apparently. In one example Preston maintained that one grain could lift a 100,000-ton object up to a height of 1.9 miles. Mathematically, if the calculations are based upon $\Delta E = \Delta mc^2$ then mass of one grain (64.79891 milligram) possesses energy equal to 5.832×10^{12} J if completely annihilated. Also energy required to lift (mgh) one hundred thousand ton (9.0718×10^7 kg.) to height of 1.9 miles (3.0577×10^3 m) is 2.7006×10^{12} J. The calculations imply that Preston used equation $\Delta E = \Delta mc^2$ in form $\Delta E \propto \Delta mc^2$. Further author could not get complete book *Physics of the Ether* published in 1875 as it falls in category of rare books and cost of the book is $2,500.

Q.14 Italian Olinto De Pretto speculated $\Delta E = \Delta mc^2$ in its precise form in 1903-04. While Einstein derived the same. Which of two must get the credit of discovery of $\Delta E = \Delta mc^2$?
Italian Olinto De Pretto deserves credit for innovating $\Delta E = \Delta mc^2$ first of all and Einstein for mathematically deriving the same.

As per ethics and policies of science the credit for discovery of $\Delta E = \Delta mc^2$ as a primary or principal inventor and the same was also suggested by Italian De Pretto.

More significantly it is Einstein who derived $\Delta L = \Delta mc^2$ (incidentally it was suggested by Newton in 1704, about 200 years before) . Thus Einstein must be given credit for deriving $\Delta L = \Delta mc^2$ i.e.

$\Delta m = \Delta L/c^2$ or $\Delta L = \Delta mc^2$ (5.3)

Then from $\Delta L = \Delta mc^2$ Einstein speculated without proof $\Delta E = \Delta mc^2$. Einstein used equation

$I^* = I\,[1\text{-v/c cos}\phi\,]\,/\,[(1\text{-v}^2/\text{c}^2)^{1/2}]$ (5.2)

to derive the eq.(5.3). Einstein took this equation from his June 1905 paper [7]. As discussed both this derivation and equation has serious inconsistencies.

. **Part III**
Q.15 Einstein discussed some concepts in June 1905 and Sep 1905 papers which were already discussed by other scientists. So what is Einstein's contribution?

Einstein has quoted the concepts existing from the literature, which implies that these are not Einstein's original contributions as intended by him in the paper.

For example if some one publishes Newton's laws or works in his own name then these can not be regarded as his own. The credit for contribution is only given for one who originates the law or principle for first time. One even may argue that this is his original and he was not aware of Newton's work, but even then credit will go to Newton who has discovered the same earlier. The ignorance of existing literature, misleading quotations or so called re-discovery of existing discoveries does not mean 'such inventor' is original or primary inventor. Otherwise to a single invention there will be numerous inventors as time increases.

Editors of the journals especially look for this issues and author of manuscript is required to give references of the documents on which work is based. But Editors and experts are also human beings, and all the information regarding any topic may not be in their libraries. Thus constraints are everywhere. The references in the document are about the previous work done on the topics by predecessors. This is established norm in research.

But in both the papers of Einstein, discussed here (June 1905 and Sep. 1905) there are no references, which implies that Einstein has claimed that all is his original work. Further Einstein has admitted that the work he has quoted may be partly solved by other authors, but he has done the work in new way hence he can leave the references of existing literature **[171**.

It does happens in research, scientists works for long time on topic in ignorance as it is original problem, later on it is learnt this work is already done hence all work is not rewarding at all, except scientific practice and consolation. However one can present results by new method, justifying main result of original innovator. If the new method is useful and simpler then it is adopted by the scientific community. In the process only original innovator is justified, it is established norm in the scientific research.

Q.16 Is ΔE = Δmc^2 is result of Special Theory of Relativity?
Scientifically it is not result of Special Theory of Relativity i.e. June 1905 paper.
The general mass energy equation i.e.

$\Delta E = \Delta mc^2$ (5.24)

existed before The Special Theory of Relativity, as it was suggested by De Pretto in 1903-04. Hence $\Delta E = \Delta mc^2$ cannot be called result of Special Theory of Relativity (Einstein's June 1905 paper). However indirectly Einstein used equation

$I^* = I\,[1\text{-v/c cos}\phi\,]\,/\,[\,(1\text{-v}^2/\text{c}^2)^{1/2}]$ (5.2)

from his June 1905 paper to derive $\Delta L = \Delta mc^2$ under classical conditions (v<<c). Then without

mathematical derivation from $\Delta L = \Delta mc^2$, Einstein speculated $\Delta E = \Delta mc^2$. Both the derivation of $\Delta L = \Delta mc^2$ and eq.(5.2) have limitations. Thus $\Delta E = \Delta mc^2$ can not be regarded as consequence of Special Theory of Relativity. When v<<c, then various variables are absolute, Einstein has used this condition in

derivation of $\Delta L = \Delta mc^2$.

Q.17 What is Einstein's Special Theory of Relativity?
Einstein never published the paper with this title, however his June 1905 paper is so called.
Einstein never published any paper with title Special Theory of Relativity. Einstein's June, 1905 paper is called as Special Theory of Relativity; however title of this paper **[8]** given by Einstein is "Electrodynamics of Moving Bodies."

The main scientific contents of Einstein's June 1905 paper are
(i) two postulates of relativity
(a) the principle of relativity
i.e. laws of physics remain the same for inertial observers (which are either at rest or moving with uniform velocity)
(b) Constancy of velocity of light.
i.e. the speed of light remains constant irrespective of relative motion of observer and source.
(ii) The phenomena of length contraction, time dilation, relativistic increase in mass, relativistic form of kinetic energy etc.

It is interesting to note both postulates of relativity existed before Einstein. The first postulate was given by Galileo in 1632 in his book **[1] Dialogue concerning the Two Chief World Systems i.e. 273 years before,** then it was used by Newton and by other scientists. This book remained on the Index of Prohibited Books from 1633 to 1835, as the Papal Inquisition was abolished in 1820. Similarly second postulate of constancy of speed of light, is result of Michelson Morley experiment, Maxwell's and Poincaire analysis etc. So none of the postulates is Einstein's own original contribution, these are simply quoted from the existing literature.

Further the phenomena of Length contraction, time dilation and relativistic increase in mass were given by Lorentz in book (Versuch Einer Theorie Der Elektrischen Und Optischen Erscheinungen In Bewegten Körpen") published in 1895. The equation for The Time Dilation was also derived by Larmor in 1900 and it is also direct consequence of Lorentz Transformation. These are not Einstein's original contribution. In a 1907 paper, Einstein credits this specific book with introducing him to time dilation, which Lorentz called "local time".

As far as relativistic form of kinetic energy is concerned it was derived by Einstein from existing method. We have.

$$KE_{rel} = (M_{motion} - M_{rest})c^2 \quad (5.25)$$

where KE_{rel} is relativistic form of kinetic energy, M_{motion} is relativistic mass when body moves with velocity v, M_{rest} is the mass of body when it is at rest. The derivation of eq.(5.25) is identical to that of classical form of energy i.e.

$$KE = \tfrac{1}{2} M_{rest} v^2 \quad (5.26)$$

The classical form of kinetic energy i.e. $\tfrac{1}{2} M_{rest} v^2$ is originated from
$$dW = dK = \{d(M_{rest} v)/dt\} \, dx = M_{rest} [dv/dt] dx = M_{rest} \, dv \, (dx/dt) = M_{rest} \, vdv$$
or $W = K = 1/2 M_{rest} v^2 \quad (5.26)$

Einstein has simply replaced M_{rest} by M_{motion} and identically solved the equation.

$$M_{motion} = M_{rest} / (1-v^2/c^2)^{\tfrac{1}{2}}$$
$$dW = dK = d/dt \, [\, M_{rest} /(\, 1-v^2/c^2)^{1/2} \,] \quad (5.27)$$

$W_{rel} = KE_{rel} = (M_{motion} - M_{rest})c^2$ (5.25)

Thus result is eq.(5.25), the equation for relativistic form of kinetic energy or work done. It can be critically analyzed from the existing literature that whether or nor eq,(2.25) existed before Einstein June 1905 or not.

Chapter III

$\Delta E = \Delta mc^2$ cannot obtained from Total or Relativistic Energy

Part I

Q.1. Who suggested first of all mass increases with velocity?

Q. 2. Name of scientists who initially experimentally confirmed that mass increases with velocity?

Q.3 What is the contribution of Einstein in this regard?

Part II

Q.4 Under what conditions work done becomes positive, zero or negative?
Q5 . How does equation for kinetic energy follows from the work ?

Q.6 What are similarities and dissimilarities regarding the relativistic and classical forms of kinetic energies?
Q.7 What are conditions for derivation of $KE_{rel} = c^2 (M_{motion} - M_{rest})$?
Part III

Q.8 How Einstein derived $E_{rest} = M_{rest} c^2$ from $KE_{rel} = c^2 (M_{motion} - M_{rest})$?
Q.9 How Einstein's method to obtain is $E_{rest} = M_{rest}c^2$ incorrect?

Q.10 How do you claim that $E_{rest} = M_{rest} c^2$ should not be regarded as mass annihilated to energy or energy materialized to mass ?

Explanations to above Questions

Part I

Q.1. Who suggested first of all mass increases with velocity?

The Dutch Physicist Hendrik Antoon Lorentz (1853-1928) firstly suggested that mass of body increases with velocity. The peculiar aspect about Lorentz is that perhaps he is only the physicist who taught at school, at one stage of his career and won Nobel Prize. Mathematically increase in mass with velocity is given by

M_{motion} or $M_{rel} = M_{rest} / (1-v^2/c^2)^{1/2}$ (5.28)

where M_{rest} is mass at rest, M_{motion} is mass when body moves with velocity v and c is speed of light.

Increase in mass is related with length contraction.
Lorentz assumed that the mass of a particle was due to the potential energy of its own charge. When particle moves with speed comparable to that of light then its length contracts. As the particle is contracted its potential energy would increase and hence mass will increase. The length contraction and increase in mass are reciprocal to each other. If the length decreases by factor $(1-v^2/c^2)^{1/2}$, then mass will

increase by the same factor.

Earlier the Irish physicist George Francis Fitzgerald, in 1889 suggested the contraction in length to explain negative results of Michelson Morley experiments.Mathematically we have

$$L_{motion} = L_{rest} (1 -^2/c^2)^{1/2} \text{ (5.29)}$$

where L_{motion} is the length of object observed by the moving observer, L_{rest} is the length measured when object is at rest. Thus according to Lorentz the mass of body must increase by the same factor i.e. $(1-v^2/c^2)^{1/2}$, as given by eq.(5.28)

Q. 2. Name of scientists who initially experimentally confirmed that mass increases with velocity?

First of all Kauffman [18] in 1900- 01 experimentally verified the variation of mass with velocity i.e. transverse mass of electron increases when it moves with high velocity. Then Bucherer [19] in 1908 confirmed that the e/m for fast moving electrons is smaller, which implies that mass of fast moving electron increases.

Q.3 What is the contribution of Einstein in this regard?
No contribution at all. It is illogical to give Einstein any type of credit for others' work.
Further regarding this equation. In 1948 in letter Einstein wrote to Lincoln Barnett

"It is not good to introduce the concept of the mass $M = m /(1-v^2/c^2)^{1/2}$ of a body for which no clear definition can be given. It is better to introduce no other mass than 'the rest mass' *m*. Instead of introducing *M*, it is better to mention the expression for the momentum and energy of a body in motion."

But the eqaution which Einstein wanted to replace was extensively used by him in his June 1905 paper and afterwards. So it was hurried suggestion by the legend. Einstein has obtained the relativistic form of KE

$$(KE)_{rel} = c^2 (M_{motion} - M_{rest}) \text{ (5.25)}$$

using equation

$$M_{motion} = M_{rest} /(1-v^2/c^2)^{1/2}$$

in his June 1905 paper. Then from eq.(5.25) Einstein derived the Rest Mass Energy i.e.
$E_{rest} = M_{rest} c^2$.

Part II

Q.4 Under what conditions work done becomes positive, zero or negative?
If the preliminary definition of work (product of force F and distance, S) i.e.
W=FS
is used then work is only positive or zero. For example work is only zero if the body is not displaced at all. However when the vector definition of work i.e.

$$W=F.S = Fdx\cos\theta \text{ (5.30)}$$

is used then work can be positive zero or negative (even when F and S are non-zero), depending upon value of θ, angle between F and S. It is illustrated as below.
(a) Let angle between force and displacement is zero (θ=0ꞌ) i.e. body is displaced in direction of force. Then eq.(5.30) becomes

dK = dW = F.dx = Fdxcosθ = Fdxcos0'l = Fdx (5.31)

This is nothing but ordinary form of work. If a force 1N pushed the body in its own direction through a distance of 20m, then

W = 1Nx20m = 20J (5.32)

It is an example of positive work.
(b) Let angle between force and displacement is 90º (θ=90º) i.e. body is displaced in direction perpendicular to that of force. In an example when coolie a carries head load and walks on the road. Then eq.(5.30) becomes

dT = dW = F.dx = Fdxcosθ = Fdxcos90'l = Fdx(0) = 0 (5.33)

We have deduced that
(c) Mathematically work can also become negative if the angle between force and displacement is 180º. But this case is not discussed here.

W = F.S = FScos180º = –FS (5.34)

For example work done by force of friction is negative.
Thus work done under different situations can be positive, negative or zero. It must be noted that work is also related with kinetic energy.

Q5 . How equation for kinetic energy does follows from the work?
It is essence of Work Kinetic Energy Theorem.
Work done can be calculated with help of with one dimensional kinematical equation, which means uniformly accelerated motion.

$v^2-u^2 =2aS$ or $a = (v^2-u^2) / 2S$ (5.35)
Also, $W = FS = (M_{rest}$ a$)$ S (5.36)

Substituting the value of eq.(5.35) in eq.(5.36)

$W = FS = (M_{rest}$ a$)$ S $= \{M_{rest} (v^2-u^2)$ S$\} / 2S$
$= M_{rest}v^2 /2 – M_{rest}u^2/2$
= Change in kinetic energy (5.37)

The eq.(5.37) is known as Work Kinetic Energy Theorem.
If the body starts from the rest i.e. u =0 and possesses accelerated motion then

$W = FS = (M_{rest}$ a$)$ S $= M_{rest}v^2 /2$ (5.26)

which is equation for KE for body at final point, which may be any arbitrary point.
Thus the kinetic energy of a body in motion is equal to the work it can do while coming to rest.
Or Kinetic energy of body can be understood as maximum work it can do. Realistically the equation of kinetic energy as derived above is meant for ACCELERATED MOTION only as evident from eqs.(5.35-5.37, 5.26)

Q.6 What are similarities and dissimilarities regarding the relativistic and classical forms of kinetic energies?
The basic dissimilarity is that in derivation of relativistic form of kinetic energy relativistic mass is used and in classical form of kinetic energy ordinary mass is used.

There are following similarities between classical and relativistic form of kinetic energies i.e. KE $= M_{rest}v^2/2$
and W = K $= c^2 (M_{motion} - M_{rest})$
(i) The both are originated from the same equation i.e.

W = F.S = FScosθ (5.30)

where θ is angle between force F and displacement S. The eq.(5.25) and eq.(5.26) are obtained when θ = 0'l

iii. The general mathematical method for both the equations is precisely the same.
(iii) The both are meant for accelerated motion.

Dissimilarities between two equations.

There is main dissimilarity between two equations.
In classical form of kinetic energy,

KE $= M_{rest}v^2/2$ (5.26)

the rest mass i.e. M_{rest} is used. The velocity of body is in classical region i.e. v<<c.
On the contrary, in relativistic form of kinetic energy,

$KE_{rel} = c^2 (M_{motion} - M_{rest})$

the relativistic mass i.e.

M_{motion} or $M_{rel} = M_{rest}/(1-v^2/c^2)^{1/2}$

is used and velocity is regarded in relativistic region. From relativistic form of kinetic energy the classical form of kinetic energy can be obtained using Binomial Theorem.

Q.7 What are conditions for derivation of $KE_{rel} = c^2 (M_{motion} - M_{rest})$ **?**
There are severe constraints on derivation of Relativistic form of Kinetic Energy.

The equation $KE_{rel} = c^2 (M_{motion} - M_{rest})$ is derived under various conditions. Without studying these conditions the understanding of relativistic kinetic energy and its critical analysis is not complete.

For examples,
(i) **Body should move :** The originating equation is

dK = dW = F.dx = Fdx cosθ (5.30)

Here kinetic energy or work done is calculated thus first and foremost condition is that body should move i.e. the displacement must be non-zero. If dx = 0 or v = 0 (even exceptionally high amount of force acts on body and enormous amount of energy is spent by external agency); then very first equation is zero i.e.

dW = dK= Fdx=0 (5.38)

Hence neither KE $= M_{rest}v^2/2$ and $KE_{rel} = c^2 (M_{motion} - M_{rest})$ is not possible, as first equation itself does not exist.

    i. **Body should move in direction of force:** It is not always necessary that body will be displaced in the direction of force. The force can act in any line making an angle θ with the displacement. If force displaces the body in its own direction then θ =0 ^{o}

$dK = dW = Fdx \cos\theta = Fdx \cos0^o = Fdx$ (5.33)

    a. When a coolie walks carrying head load, then he applies force against the force of gravity, in the upward direction. The weight of body is vertically downward direction and force applied by person is in vertically upward direction. Thus angle between applied force and the displacement of coolie is 90°.

$W = FS\cos90^o = 0$ (5. 33)

Hence none of the other equations including $W_{rel} = KE_{rel} = c^2 (M_{motion} - M_{rest})$ equations exist. Thus there is state of mathematical cipher or void or vacuum.

    b. When angle between force and displacement is more than 0 ^{o} and less than 90 ^{o} then value is less than unity but non-zero. In that case value of equation

$dK = dW = F.dx = Fdx\cos\theta \neq Fdx$
Hence equation for relativistic form of kinetic energy

$KE_{rel} \neq c^2 (M_{motion} - M_{rest})$ is not produced.

Also under this condition, classical form of kinetic energy is

$KE \neq M_{rest}v^2/2$.

This aspect is not discussed in the existing literature. Even Einstein chose the simplest case in which he derived the relativistic form of kinetic energy **[8].**

    i. **The velocity of body must be in relativistic region.** In the derivation, relativistic variation of mass with velocity is considered which is only significant if velocity of body is comparable to that of light. For example,

M_{motion} or $M_{rel} = M_{rest} / (1-v^2/c^2)^{1/2}$

If the velocity is in classical region then

M_{motion} or $M_{rel} = M_{rest}$ (5.39)

Hence in this case only classical form of energy i.e.

$KE = M_{rest} v^2/2$ (5.26)

Thus to obtain the relativistic form of kinetic energy

$KE_{rel} = c^2 (M_{motion} - M_{rest})$ (5.25)

the velocity of body must be in relativistic region i.e. comparable to velocity of light. Only from $KE_{rel} = c^2 (M_{motion} - M_{rest})$ Einstein obtained $E_{rest} = M_{rest} c^2$ that too arbitrarily i.e. body is at rest.
(iv) **Contradictory conditions of velocity.** In the derivation following two equations are used, which are

applicable under different conditions i.e. velocity of body must be consistently variable (accelerated) in one case and uniform in other case.

(a) $dK = dW = F.dx = (dp/dt) \, dx = \{m \, (v-u)/t\} \, dx$ (5.40)

This equation requires that the velocity of body must be consistently variable such that acceleration is uniform i.e. a = constant. If v is uniform then eq.(5.40) becomes zero i.e.
$dK = dW = \{m \, (v-u)/t\} \, dx = 0$
(b) The second equation is

M_{motion} or $M_{rel} = M_{rest} / (1-v^2/c^2)^{1/2}$ (5.28)

This equation requires that the velocity of body must be uniform. Both these equations are simultaneously used in the derivation. But the conditions of applications are entirely different i.e. in one case velocity of body must be variable and in other cases it must be constant. Thus two contradictory conditions are simultaneously used in derivation.

Part III

Q.8 How Einstein derived $E_{rest} = M_{rest} \, c^2$ from $KE_{rel} = c^2 \, (M_{motion} - M_{rest})$?
Einstein derived $E_{rest} = M_{rest} \, c^2$ arbitrarily, under the strange condition when first equation is zero and final equation is non-zero.

Einstein derived equation

$E_{rest} = M_{rest} \, c^2$ (5.41)

from $KE_{rel} = c^2 \, (M_{motion} - M_{rest})$ arbitrarily and asserted that it represents inter-conversion of mass to energy or vice-versa. As the name suggests E_{rest} is rest mass energy i.e. energy of body at rest [20]. Einstein applied this condition that body is at rest (u =0) to relativistic form of kinetic energy in arbitrary way. Now we have,

$KE_{rel} = c^2 \, (M_{motion} - M_{rest})$ (5.42)
$KE_{rel} + M_{rest} \, c^2 = M_{motion} \, c^2$

    i.   Applying the condition when body is at rest i.e. v =0 , dx=0 , then eq.(5.42) becomes,

        $KE_{rel} = c^2 \, [M_{rest} / (1-v^2/c^2)^{1/2} - M_{rest})]$ (5.43)
        $0 = c^2 \, [M_{rest} / (1-0/c^2)^{1/2} - M_{rest})]$
        $M_{rest} = M_{rest}$ or 1 =1 (5.44)

        which is true. The eq.(5.43) possesses no dimensions and no units. Thus result is in no case

        $E_{rest} = M_{rest} \, c^2$ (5.45)

    ii.   Applying the condition when body is at rest i.e. v =0 , dx=0 , then eq.(5.42) becomes,

$KE_{rel} + M_{rest} \, c^2 = c^2 \, M_{rest} /(1- v^2/c^2)^{1/2}$ (5.42a)
$0 + M_{rest} \, c^2 = M_{rest} \, c^2$
$1 = 1$ (5.44)

which is true. Thus result in both the cases is not $E_{rest} = M_{rest} c^2$ under similar conditions.

(iii) If we re-write eq.(5.42) as

$KE_{rel} + M_{rest} c^2 = M_{rest} c^2$ = Relativistic energy (5.46)

Applying the condition when body is at rest i.e. v =0 , dx=0, (when body is at rest then every type of energy associated with it zero) then eq.(5.46) becomes,

$0 + M_{rest} c^2 = M_{rest} c^2 = 0$

Thus $M_{rest} c^2 = 0$

Now $M_{rest} \neq 0$ and $c \neq 0$, thus equation cannot be interpreted in this way. It is true as under this condition even first equation i.e. eq.(5.30) becomes zero.

Hence this result cannot be called as

$E_{rest} = M_{rest} c^2$

In fact when v=0, even first equation does not exists. Hence the rest of equations cannot be interpreted, it follows from the analysis.

(vi) The Einstein arbitrarily wrote,

Einstein wrote Relativistic energy (at rest, v = 0) = Rest Mass Energy (E_{rest})

By definition when body is at rest it does not posses even classical form of kinetic energy.

Hence applying the condition v =0, dx=0 in eq.(5.46)

$0 + M_{rest} c^2 = M_{rest} c^2 = E_{rest}$ (5.41)

or $E_{rest} = M_{rest} c^2$

Thus, in this way Einstein concluded that

$E_{rest} = M_{rest} c^2$ (5.41)

But the Einstein obtained eq.(5.41) in arbitrary and unscientific way.

(v) The equation for kinetic energy in the classical region is given by

$KE = M_{rest} v^2/2$

If this condition (i.e. v =0) is applied then

$KE = M_{rest} v^2/2 = 0$

Even now in no cases result

$E_{rest} = M_{rest} c^2$ (5.45)

In fact in this case the kinetic energy of body is zero i.e. KE =0.

Thus Einstein's condition for obtaining $E_{rest} = M_{rest} c^2$ is unscientific and arbitrary.

The mandatory requirement for obtaining $E_{rest} = M_{rest} c^2$ is that equation for relativistic variation of mass must be used,

$$M_{motion} = M_{rest} / (1 - v^2/c^2)^{1/2}$$

must be used. The application of this equation brings c^2 in picture.

Q. 9 How Einstein's method to obtain is $E_{rest} = M_{rest}c^2$ incorrect?

In this regard the short answer is *how Einstein's method is correct*?

The eq. (5.42) is interpreted as Einstein's Mass-Energy equivalence completely ignoring the following aspects.

(i) It must be noted that if dx=0, v = 0, or KE = 0, then eq.(5.30) is also zero i.e.

dW=dK=F.dx = 0

Then rest of the equations or the following equations are NON-EXISTENT i.e. completely devoid of existence or not even defined.
or dT = dW = F.dx = d [M_{motion} v]/dt dx ....Non-Existent or undefined
$KE_{rel} = W_{rel}$= (M_{motion}− M_{rest})c^2 .... Non-Existent or undefined
KE [as defined eq.(5.42)] + $M_{rest}c^2$ (Rest mass Energy) = Relativistic Energy .... Non-Existent
If body is at rest then all others or following equations as cited above are non-existent or undefined.

No rule of the science or mathematics permits that non-existent equation (when first equation vanishes), be interpreted to get WELL DEFINED physical results. In case there is any, then it must be highlighted. If the first equation becomes ZERO, then 10th equation (say) is NON-EXISTENT and it can never lead to non-zero results $E_{rest} = M_{rest}c^2$ (v=0 , dx=0), whosoever may be the interpreter (may be non-Einstein or Einstein). If first equation is zero and final equation is non-zero then it is like getting output from no input. In physical sense it is like violation of conservation laws.

Q. 10 How do you claim that $E_{rest} = M_{rest} c^2$ should not be regarded as mass annihilated to energy or energy materialized to mass ?
Here E_{rest} is rest mass energy and M_{rest} rest mass. There is no term which represents annihilation of mass or materialization of energy.

In the derivation there is no term which takes in account *mass annihilated* to *energy* or *energy materialized* to *mass*. Here M_{rest} is mass of body at rest, it is not mass annihilated to energy or mass created from energy. Similarly E_{rest} is energy of body at rest, it is not energy created from mass or energy materialized to mass e.g. energy of gamma ray photon is converted into electron-positron pair. The mass is annihilated to energy or energy is materialized to mass as given by $\Delta L = \Delta mc^2$ or $\Delta E = \Delta mc^2$. So it is completely arbitrary to interpret $E_{rest} = M_{rest} c^2$ as mass is annihilated to energy or energy is materialized to mass. This aspect can be further justified as below.

We have equations for kinetic energy, potential energy and rest mass energy as

Kinetic Energy = $M_{rest}v^2$ /2,
Potential Energy = M_{rest} gh
Rest Mass Energy, $E_{rest} = M_{rest}c^2$

These equations of energy have one thing common that they are derived from the same original equation. The equation from all the equations originate is eq. (5.30) i.e.

dW = dK = F.dx = Fdx cosθ (5.30)

If $E_{rest} = M_{rest} c^2$ is interpreted as mass annihilated to energy and vice-versa, then equations $KE = M_{rest}v^2/2$ and $PE = M_{rest}gh$ are also interpreted as in similar way. It implies that $E_{rest} = M_{rest}c^2$ can not be interpreted as annihilation of mass to energy or energy materialized to mass.

In view of it even one can speculate that when mass is annihilated then force ($F = M_{rest} a$) will also change and there are many more equations which will qualify this criterion of explanation of interconversion.

Chapter 4.
Derivation Of The Generalized Form Of Mass-Energy Equivalence And Its Applications
Part I
Q.1 Is $\Delta E = \Delta mc^2$ is applicable in chemical, volcanic , cosmological , astrophysical reactions and creation of

mass before Big Bang. $\Delta E = Ac^{2\Delta} m$?
Q.2 How does $\Delta E = \Delta mc^2$ fail to explain the energy emitted by Gamma Ray Bursts ?

Q.3 How does $\Delta E = Ac^{2\Delta} m$ explains the energy emitted by Gamma Ray Bursts?
Q4. What is antimatter? How it is produced? Where it is used?
Part II

Q.5 How the Primordial Theory of universe differs from Big Bang Theory?
Q.6 What is the reason of origin of Gravitation on the basis of $\Delta E = Ac^{2\Delta} m$?

Q.7 How does $\Delta E = \Delta mc^2$ fail to explain mass of universe 10^{55} kg before Big Bang?

Q.8 How does $\Delta E = Ac^{2\Delta} m$ explain mass of universe 10^{55} kg before Big Bang ?

Q.9 How does equation $\Delta E = Ac^2\Delta m$ applies to formation of Black Holes ?
Part III

Q.10 What are other advantages of the $\Delta E = Ac^2\Delta m$?
Q 11.Who is regarded as father or creator of Atom Bomb?

 Part I

Q.1 Is $\Delta E = \Delta mc^2$ is applicable in chemical, volcanic , cosmological , astrophysical reactions and creation of mass before Big Bang ?
YES. $\Delta E = \Delta mc^2$, is applicable to all such phenomena as these involve interconversion of mass to energy or vice-versa.
(a) Applicability: It must be noted that earlier **Einstein [8]** derived equation between Light Energy and mass i.e.

$\Delta L = c^{2\Delta} m$, which implies that when mass is annihilated then the light energy is produced. Then Einstein generalized, $\Delta L = \Delta mc^2$ to $\Delta E = \Delta mc^2$ for all types energies (e.g. light energy, heat energy, chemical energy, nuclear energy, magnetic energy, electrical energy, sound energy, energy emitted in form of invisible radiations, energy emitted in cosmological and astrophysical reactions etc.) without proof. Thus there is rather speculative transition (not derivation) of $\Delta L = \Delta mc^2$ to $\Delta E = \Delta mc^2$ without mathematical proof. So there was no change in RHS of equation and only in LHS the L (light energy) was replaced by E (all types of energies) in RHS. Thus $\Delta E = \Delta mc^2$ holds good in all the cases.
(b) Conversion Factor: Thus, $\Delta E = \Delta mc^2$ holds good for those reactions which involve interconversion of mass to energy or vice –versa. Now according to law of conservation of mass,
"the mass can neither be created nor be destroyed but can be converted from one form to other."
$\Delta E = \Delta mc^2$ implies that mass can be converted to energies (light, heat, sound, chemical, electrical etc.) and constant (conversion factor) in all cases is equal to c^2 (9×10^{16} m^2/s^2).

It implies that mass is other form of energy and conversion factor is rigidly c^2. Hence whenever energy is emitted it is always at cost of mass (other form of energy), it can never be out of VOID or CIPHER.

(i)Chemical reactions and volcanic eruption.
In these reactions energy is emitted at cost of mass, but in chemical reactions mass annihilated is too less to be precisely measured. For example in explosion of dynamite the mass annihilated is of the order of 10^{-11} kg, but in nuclear reaction masses of magnitude billion times smaller are accurately estimated. Thus nuclear reactions are very well studied but not chemical reactions as far as measurement of mass annihilated is concerned.

In volcanic reactions energy emitted is comparatively higher, but energy emitted is completely unorganized to draw any quantitative conclusions. Both types of reactions were available in time of Einstein but he did not apply $\Delta E = \Delta mc^2$ to such phenomena at all or even did not hint about its applications. Till date $\Delta E = \Delta mc^2$ is not confirmed in case of chemical reactions but regarded as true, which is unscientific.

(ii)Nuclear fission and nuclear fusion
It is well known that energy emitted in fission and fusion is well described by $\Delta E = \Delta mc^2$ as mass is converted to energy. In nuclear reactions $\Delta E = \Delta mc^2$ is used as standard or reference as there are TWELVE months in a year, not ten and there are SEVEN days in a week not ten. The conversion factor regarding energy and mass (1 Atomic Mass Unit = 931.5 Million Electron Volt) is based upon $\Delta E = \Delta mc^2$.

But understanding of $\Delta E = \Delta mc^2$ is not complete unless some other aspects (i.e. when contradictory results are observed) are not mentioned. There are some deviations from $\Delta E = \Delta mc^2$ in nuclear reactions need to be mentioned for balanced analysis.

(a) Firstly the Total Kinetic Energy of fission fragments of U^{235} and Pu^{239} is found 20-60 MeV less than predicted by $\Delta E = \Delta mc^2$, it has been described by Bakhoum [21] along with details. However Bakhoum has tried to explain it on the basis of equation, $H = mv^2$ which is obtained on the basis of de Broglie Wave Mechanics. There are other traditional explanation to this effect. It can be explained with help of $\Delta E = Ac^{2\Delta} m$ with value of A less than unity, which is $H = mv^2$.
(b) Secondly mass of particle Ds (2317) discovered by A. Palano [22], at Stanford Linear Accelerator Centre is found less than the current estimates are based upon $\Delta E = \Delta mc^2$.
The lesser mass of the particle can be explained if the value of A is assumed to be more than one ($\Delta m = \Delta E /Ac^2$) . These deviations can be explained with help of $\Delta E = Ac^{2\Delta} m$ which implies that conversion factor is Ac^2 i.e. different from c^2 (conversion factor in this case of $\Delta E = \Delta mc^2$)

Annihilation of particle and antiparticle.
The basic difference between annihilation of particle – antiparticle pair and nuclear fission or fusion is that in particle and antiparticle annihilation no mass is left behind. Whereas in nuclear fission and fusion considerable mass is left behind i.e. all matter is not converted into energy.
(a) Mass converted to energy: Firstly annihilation of electron (9.1×10^{-31} kg, 0.51MeV) and positron (an antiparticle of electron having same mass and energy) pair to energy i.e. Gamma Ray photon of energy 1.0225 MeV is produced. Mathematically,

$\Delta E = \Delta mc^2 = 2 \times 9.1 \times 10^{-31}$ kg $\times 9 \times 10^{16}$ m^2/s^{-2} $= 1.638 \times 10^{-13}$ J $= 1.0225$MeV (5.47)

   a. **Energy is converted into mass:** Secondly materialization of energy of Gamma Ray Photon (1.0225 MeV) to mass i.e. electron positron pair (total mass 18.2×10^{-31} kg) can be discussed.

$\Delta m = \Delta E/c^2 = 1.0225$MeV $/c^2 = 1.638 \times 10^{-13}$ J$/9 \times 10^{16} = 18.2 \times 10^{-31}$ kg (5.48)

As $\Delta E = \Delta mc^2$ is applicable in explaining the annihilation of electron-positron pair to energy (mass to energy) or materiasation of Gamma Ray Photon to electron–positron pair (energy to mass).

Like wise $\Delta E = \Delta mc^2$ is applicable to Astrophysical reactions and creation of mass before Big Bang; these reactions or phenomena also involve inter-conversion of mass to energy. However the results are not consistent

with $\Delta E = \Delta mc^2$, which are clear contradictions e.g. energy emitted by Gamma Ray Bursts.

Q.2 How does $\Delta E = \Delta mc^2$ fail to explain the energy emitted by Gamma Ray Bursts ?
$\Delta E = \Delta mc^2$ predicts that in GRBs mass comparable to mass of the sun must be annihilated.

The Gamma Ray Bursts (GRBs) are intense and short bursts of gamma-ray radiations ; which implies for small mass (simply gamma rays), in small region, in small time huge amount of energy i.e. 10^{47} J is liberated. The phenomena of GRB occur at distant galaxies and detected by satellites such as the Compton Gamma Ray Observatory (CGRO) and the Interplanetary Network (IPN). The most recent and extensive mission to study GRBs is The Swift Gamma-Ray Burst Mission by NASA. Both the equations can be tried to explain the energy of GRBs.

(a) If Einstein's $\Delta E = \Delta mc^2$ (regarded as confirmed in electron-positron pair) is used to explain the energy emitted by Gamma Ray Bursts, then it requires mass

mass $= 10^{47} / 9 \times 10^{16} = 1.11 \times 10^{30}$ kg (5.49)

This mass annihilated is comparable with mass of the Sun is annihilated in within a fraction second, in Gamma Ray Bursts this much amount of mass is never possible in the phenomena.

Q.3 How does $\Delta E = Ac^{2\Delta} m$ explains the energy emitted by Gamma Ray Bursts?
$\Delta E = Ac^{2\Delta} m$ predicts that due exceptionally higher value of A for annihilation of small mass huge amount of energy will be emitted.

According to the generalized form of mass energy equivalence, $\Delta E = Ac^{2\Delta} m$ the conversion factor (as consistent with existing literature) can be more than c^2, as the mass energy inter-conversion processes are mysterious processes in nature. The nature and characteristics of A are consistent with century old concept of constants or co-efficients of proportionality. This deduction is amply justified and confirmed here.

Gamma Ray Bursts (simply involve burst of Gamma Rays), the mass annihilated in single flash lasting for 0.1-100s. Just for simplicity (for understanding of value of A) let us assume that mass annihilated in this case is 10^{-16} kg. The value of A (mass annihilated in this case is 10^{-16} kg) can be assessed as

$A = \Delta E / c^{2\Delta} m$
$A = 10^{45}$ J$/ 9 \times 10^{16} \times 10^{-16} = 1.11 \times 10^{44}$ (5.50)

We have generalized form energy equation as

$\Delta E = Ac^{2\Delta} m$ (5.51)

Thus under these estimates i.e. equation $\Delta E = Ac^{2\Delta} m$ becomes,

$\Delta E = Ac^{2\Delta} m = 1.11 \times 10^{44} c^{2\Delta} m$ (5.52)

It implies that for annihilation of dwindling mass 10^{-16} kg , in short time unimaginably high amount of energy is emitted, which can be explained with help of $\Delta E = Ac^{2\Delta} m$ with exceptionally high value of A. It is direct confirmation for $\Delta E = Ac^{2\Delta} m$ with very high value of A i.e. for annihilation of small mass (burst of Gamma Ray), in short time enormous amount of energy is emitted. Thus conversion factor between mass and energy is not always c^2 i.e. same as in nuclear reactions. Thus it is justified that it depends upon inherent characteristic conditions of the process. Like this energy emitted in case of other heavenly bodies and phenomena can be explained.

Q4. What is antimatter? How it is produced? Where it is used?
Antimatter is the most costly matter about $62.5 trillion a gram. It is produced in the most sophisticated laboratories. It can be used for production of energy.

A hydrogen atom consists of an electron in extra nuclear part and proton in the nucleus.
The mass of electron is 9.1×10^{-31}kg and charge on electron is 1.602×10^{-19}C (negative). The anti-electron has the same mass as that of electron i.e. 9.1×10^{-31} kg , but it contains positive charge equal to 1.602×10^{-19}C. Thus mass of electron and anti-electron are the same, the magnitude of charges are the same but electron has negative charge and anti-electron has same positive charge.

Similarly mass of proton is 1.672×10^{-27} kg and charge on proton is 1.602×10^{-19}C (positive). The anti-proton has the same mass as that of proton i.e. 1.672×10^{-27} kg , but it contains positive charge equal to 1.602×10^{-19}C. Thus mass of proton and anti-proton are the same, the magnitude of charges are the same but proton has positive charge and anti-proton has same amount of negative charge.

Thus as electron and proton constitute hydrogen, likewise anti-electron and anti-proton consist of anti-hydrogen. Thus other anti-atoms and anti-molecules are formed which constitute antimatter.

Antiprotons do not exist in nature and currently are produced only by energetic particle collisions conducted at large accelerator facilities e.g. in Fermi National Accelerator Laboratory, FermiLab, in the U.S. or CERN (European Organization for Nuclear Research) in Geneva Switzerland.

The reactions between matter and anti-matter particles are regarded as 100% efficient i.e. all matter and antimatter is annihilated in the process. These reactions offer maximum energy out put but production if antimatter is a serious problem.

Part II
Q.5 How the Primordial Theory of universe differ from Big Bang Theory?
The applicability of Big Bang Theory begins when that of Primordial Theory ends. Thus both cannot be compared.
(i) Big Bang Theory:
(a) It assumes that there was ready made mass of universe equal to 10^{55}kg in super heated and condensed state. It suddenly exploded and ever since universe is expanding and there are experimental evidences to this effect.
(b) In the Big Bang the time is measured after 10^{-43} seconds of Big Bang as permitted by Quantum mechanical calculations based on Heisenberg uncertainty principle. It is also called Planck's Time. According to Big Bang Theory the time is not defined or did not exist before the Big Bang.
(ii) Current perception of Universe or Primordial Theory:
(a) This perception simply explains what was before Big Bang ? How the mass of the universe 10^{55} kg was formed? How it changed to super condensed or super heated state? This aspect not all discussed in the successful Big Bang Theory. All these aspects are taken as granted and existing without and question and answer. The logical answer to such questions is provided in the Big Bang Theory.
(b) Thus in the **Primordial Theory** we start from state of cipher then perceives how mass was created and condensed ? What caused Big Bang? Then things proceeds in usual way. No contradiction or conflict with the Big Bang Theory.
(c) Here we assume that universe started its life from Zeroans (particles of zero masses) moving with infinitely large velocities then changed into primordial energy pulse. This primordial energy then changed to mass. The formation of mass, manifestation of gravitation and subsequent developments of universe are explained on the basis of eq.(5.51) and eq.(5.53).
Q.6 What is the reason of origin of Gravitation on the basis of $\Delta E = Ac^{2\Delta}m$?

Mass has been converted into gravitational energy.
The reason is very simple. The gravitational energy is just other form of energy, and energy is other form of mass. Thus gravitational energy is other form of mass. The mass may firstly change to any other form of energy (including heat energy) then the energy may further transform to gravitational energy, as inter-conversion of energies in various other existing cases.
Thus it can be explained with help of eq.(5.51) and eq.(5.53) as described below.

$\Delta E = Ac^2\Delta m$ (5.51)

and

Energy emitted in annihilation of mass ($Ac^2\Delta m$) = k Gravitational energy (U_g) (5.53)

where k is conversion co-efficient between emitted energy and gravitational energy.

If the value of A is exceptionally high then for small mass large amount of energy is emitted. Further if value of k is regarded as unusually low, thus higher would be congregation of gravitational energy. Thus mass of universe got condensed to a point due to high value of A (conversion factor) in equation $\Delta E = Ac^2\Delta m$ and lower value of k in eq.(5.53).The bodies are inherited with characteristics of gravitation when these were formed.

Q.7 How does $\Delta E = \Delta mc^2$ fail to explain mass of universe 10^{55} kg before Big Bang?

It implies mass 10^{55}kg has come from energy 9×10^{71} J but from where this energy has come? Thus answer for a question is another question.

Currently mass of universe is regarded as 10^{55} kg. Definitely it was created earlier, then changed to a "primordial atom" and resulted in Big Bang. In addition to it, there is some more information about the mass of the universe. At the instant of the Big Bang nearly equal amounts of matter and antimatter were created. Now the antimatter is not detectable at all **[23].** Also scientists believe that lot of matter is present in universe in form of Dark Matter which is not detectable. But here we are only considering in calculations the well defined mass of universe i.e. 10^{55}kg. As mass is converted into energy, so mass created must be regarded as more than 10^{55} kg . Further manifestation of various forms of energy is at the cost of mass. According to $\Delta E = \Delta mc^2$ [as explained above in eq.(5.47-5.48)] it might have been produced from energy

$\Delta E = \Delta mc^2 = 10^{55} \times 3 \times 10^{16} = 9 \times 10^{71}$ J (5.54)

But from energy equal to 9×10^{71} J is produced. Thus to one query other query is the answer. Hence it is not a scientific answer to such a significant question.

Q.8 How does $\Delta E = Ac^{2\Delta} m$ explain mass of universe 10^{55} kg before Big Bang ?

$\Delta E = Ac^{2\Delta} m$ contains conversion factor, due to high value of A mass 10^{55} kg can be created from vanishing small energy, which can be assumed existing.

The equation $\Delta E = Ac^{2\Delta} m$ predicts that in primordial era, diminishingly small pulse of energy, say 10^{-4444} J (or less) equivalent to 2.4×10^{-4445} calorie (or less), manifested itself in mass 10^{55} kg, exceptionally-2 super special event. This conversion process took its own time, and initially matter was created in lighter form. Thus we have to assume at the frail pulse of energy appeared in existing in space, which was formed as discussed below.

In the beginning whole the space was filled with particles of zero mass, may be termed as Zeroans. The Zeroans are the most primary or the earliest constituents of the universe. The Zeroans can be assumed existing naturally in empty space and there is no pre-condition for their existence. No conservation law is violated, even at primordial stage with perception of Zeroans. Each zeroan moving with infinitely large velocity acted as a pulse of energy of magnitude nearly zero in due course of time. The zeroans (m=0) may have been moving in free space with infinitely large velocities in all possible directions. According to Newton's Second Law of Motion i.e. F = $M_{rest}a$, the particles of zero mass can move with higher velocities without any force.

In due course of time infinitely large number of zeroans COMBINED together to form a pulse of energy. 10^{-4444} J or less. This pulse of energy moving with exceedingly-2 large velocity materialized to large number of particles moving with high velocities in random directions or may be stationary. These particles collided to form bigger

particles, these bigger particles further combined together.

In explanation from $\Delta E = Ac^{2\Delta}m$ it is assumed that well before the Big Bang, there existed a "primordial pulse" of energy 10^{-4444} J or less; this pulse of energy changed to mass 10^{55} kg . Thus energy equal to 10^{-4444} J has been annihilated and mass equal to 10^{55}kg has been obtained. In this case value of A_{uni} can be calculated as,

$A_{uni} = 10^{-4444}/9 \times 10^{16 \times} 10^{55} = 1.111 \times 10^{-4516}$ (5.55)

Now if the value of energy is 10^{-4444} J and value of A_{uni} is 1.111×10^{-4516} J then mass can be calculated as

$\Delta m = \Delta E / Ac^2 = 10^{-4444}$ J $/ 1.111 \times 10^{-4516}$ x $9 \times 10^{16} = 10^{55}$ kg (5.56)

Thus mass of the universe can be calculated with help of equation $\Delta E = Ac^{2\Delta}m$. It further justifies that conversion factor between mass and energy is not always c^2 i.e. Ac^2.

Thus $\Delta E = Ac^{2\Delta}m$, is the first equation which at least theoretically predicts that universe (10^{55}kg) has been created from minuscule or immeasurably small amount of energy (10^{-4444}J or less, which may be easily available compared to 9×10^{71} J).

Q. 9 How does equation ΔE =Ac²Δm applies to formation of Black Holes.
It explains the origin and developments of black holes with help of eqs.(5.51-5.53)

In one of the way, the black holes are formed by very heavy exploding stars (emitting huge amount of energy), which may be regarded as super active state with very high value of A. The exploding pieces of stars require enormous amount of gravitational energy for staying together. Thus we have to explain that how large amount of energy is emitted by exploding star and how tremendous amount of gravitational energy is produced which compresses the whole mass virtually to a point. It can be explained with help of following equations

$\Delta E = Ac^2 \Delta m$ (5.51)

and
or Gravitational energy (U_g) = Energy emitted in annihilation of mass ($Ac^2 \Delta m$) / k (5.53)

It is obvious that gravitational energy is other form of mass like other energies; and the process of formation of mass and energy are inter-related. Hence,

"*formation of mass of universe and origin of gravitation are both simultaneous processes*".

The formation of Black Hole with help of above two equations can be explained with help of above two equations can be explained under certain conditions only e.g. the value of A is high and k is small.

Let Δm is mass annihilated and value of A is very high it implies that enormous amount of energy is emitted for annihilation of smaller mass. Now this energy is converted into gravitational energy as value of k is regarded as expectionally-2 low in the eq. (5.53). Thus consequently even for annihilation of the small amount of mass (Δm) mammoth amount of gravitational energy is originated in the exploding body (or in similar other bodies) which ultimately becomes Black Hole. This gravitational energy compresses the exploding star (other such body), beyond the perceivable limits. Due to high value of gravitational energy the star is compressed to extent that there is singularity (possibility of zero volume and infinitely large density) at the centre. Under this condition even light cannot escape from Black Hole

PART III

Q.10 What are other advantages of the $\Delta E = Ac^2 \Delta m$?

This equation is able to explain the various phenomena which are not explained by $\Delta E = \Delta mc^2$. For example, energy emitted by Quasars, Dark matter, outward acceleration of universe, annihilation of antimatter in Hadron epoch etc. These aspects are discussed in Chapter IV

The equation $\Delta E = Ac^2 \Delta m$ is applicable to every form of energy which involves interconversion of mass to energy, and conversion factor is Ac^2 i.e. equal, less or more than c^2.

Q 11. Who is regarded as father or creator of Atom Bomb?
This question may be as complex as to the question that who is father of science ?

As science is result of combined efforts of numerous scientists, innovators and mentors, similar is the tale of creation of Atom Bomb. The first reaction which involved is nuclear fission which was discovered by Enrico Fermi and his team in May 10, 1934. Hungarian scientist Leo Szilard left Nazi Germany and moved to England and first of all he published his views on uranium chain reaction (possible formation of bomb). It was first real suggestion about formation of Atom Bomb. This proposal was rejected by none else but Ernest Rutherford, who gave famous Rutherford Model of Atom. But Leo Szilard kept working on the problem proposing the same enthusiastically and finally saw his proposal blooming. And when atom bomb was formed (he was one member of the team) he warned against use of atom bomb to President Harry S. Truman .

In 1938 **Otto Hahn** and **Fritz Strassmann** of Germany split the uranium atom by bombarding it with neutrons and showed that the elements barium and krypton were formed. This is the precisely same reaction used in an Atom Bomb. After this reaction scientists grew far more serious in fission as a source of energy.

First proposal of Atom Bomb and Manhattan Project
On 2nd August, 1939, three Jewish scientists who had fled to the United States from Europe, Albert Einstein, Leo Szilard and Eugene Wigner, wrote a joint letter to President Franklin D. Roosevelt. They narrated about the developments that had been taking place in nuclear physics and accomplishments of German scientists. They warned Roosevelt that scientists in Germany were working on the possibility of using uranium to produce nuclear weapons. Just possible these scientists were scared of Hitler or they took this opportunity to level personal grudges.

In 1942 the Manhattan Project was set up in the United States under the command of Brigadier General Leslie Groves. The 13 main nuclear scientists were recruited to produce an Atom Bomb included Robert Oppenheimer (USA), David Bohm (USA), Leo Szilard (Hungary), Eugene Wigner (Hungary), Rudolf Peierls (Germany), Otto Frisch (Germany), Niels Bohr (Denmark), Felix Bloch (Switzerland), James Franck (Germany), James Chadwick (Britain), Emilio Segre (Italy), Enrico Fermi (Italy), Klaus Fuchs (Germany) and Edward Teller (Hungary). Only Robert Oppenheimer and his student David Bohm were Americans. Oppenheimer was a theoretical physicist (University of California, Berkeley), was appointed Director of the Manhattan Project in 1943.

In first major breakthrough Italian physicist Enrico Fermi managed at the University of Chicago reactor, called Chicago Pile 1 (CP-1), under the abandoned west stands of Stagg Field. On December 2, 1942 - 3:49 p.m., the first controlled nuclear reaction was successfully carried out. Italian Fermi did pioneering work in controlling and sustaining the reaction.

"Little Boy", "Fat Man", Truman and Japan
On July 16, 1945, the first test explosion of an Atomic Bomb in the New Mexico desert. Thus demon was ready for destruction. Harry S. Truman, the USA's new president (after death of Franklin Roosevelt), decided to use the Atom Bomb on Japan, after sudden Pearl harbor attack by Japanese. On August 6, 1945, the United States dropped the first Atomic Bomb named "Little Boy" on the Japanese city of Hiroshima. It followed with a second Atom Bomb against the city of Nagasaki on August 9, 1945. According to U.S. estimates, 60,000 to 70,000 people were killed by the Hiroshima bomb, called "Little Boy," and about 40,000 by the bomb dropped on Nagasaki, called "Fat Man.".

Science means peace
Thus with explosion of Atom Bombs, there was end of World War II. Now the people realize the catastrophic effects of Atom Bombs that the World III will be fought for seconds or minutes only never for days. Any

intentional or non-intentional or accidental misuse with nuclear weapons for few seconds will destroy the present, past and future civilizations. We cannot give life to a single individual but these weapons are capable to taking lives of hundred thousand people in no time. It takes years and lifelong earnings to build a house but these bombs can destroy thousands and thousands houses before blinking of eye. The future generations of human being, flora and fauna has inherent right on the healthy life conditions, as present generations have. These are the serious implications of the nuclear energy.

The useful way to use nuclear weapons is 'not to make' them and if exist then the most useful way to use them is 'to destroy' them indiscriminately in all over the world. There is tremendous potential of atomic energy in peace time also; a small nuclear reactor can be put in an engine of vehicle which gives energy to it for the motion. The scientific inflow can be diverted to such issues, rather than others, the accomplishments of those can do irreparable damages.

The scientists who formed the Atom Bomb found it more dangerous than they have thought before forming. In the month of June –July 1945, Leo Szilard and James Franck drafted a petition signed by just under 70 scientists, requested that devastating Atom Bomb should not be used on moral grounds. It was submitted to President Harry S. Truman, who did not agree to the petition. James Franck (A German member of Manhattan Project) , produced the Franck Report:

"Don't drop the bomb on a city. Drop it as a demonstration and offer a warning."
Today the world need numerous of individuals like James Frank.

"The science is wisdom and must be used for prolonged prosperity, parity, and peace only".

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