Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
ISSN NO. 2320-5407
Article DOI: 10.21474/IJAR01/8697
DOI URL: http://dx.doi.org/10.21474/IJAR01/8697

RESEARCH ARTICLE

THE CONCEPT OF SPEED OF TIME (SHREST THEORY) AND THE DERIVATION OF THE EQUATION FOR THE SPEED OF TIME ON A PLANET.

Shreerang and Narayankar.

Manuscript Info

Manuscript History
Received: 15 January 2019
Final Accepted: 17 February 2019
Published: March 2019

Key words:-
speed of time; shrest theory; experimental, practical & theoretical examples; factors affecting speed of time; mass of the planet; acceleration due to gravity of the planet; derivation; shrest equation; shrest unit; values of speed of time of planets; assumptions/ predictions.

Abstract

Our current research is about speed of time in various celestial bodies (especially planets and stars). The speed of time on celestial bodies (planets or stars) is a new concept which can be simply explained as: - Imagine you have landed on a certain planet and stayed there for some time. And after that you`ve gone to other planet whose size is different from the first planet. In both these cases, you will observe or experience that time is running at different speed, rate or interval. Or you will experience different time speed in both the planets (i.e. time is running faster on one planet and slower on another). This concept is known as the concept of speed of time on a planet. I also called it as "shrest theory". For example, 1) if you are throwing an exactly same ball at an aim with same magnitude while being at two different planets, then you will observe that the ball will hit aim at different time (i.e. one will hit earlier and other will hit later) due to different value of speed of time in those two planets. 2) If you run/walk on two different planets with same magnitude, you will find that you are taking different time to reach the destination. 3) Astronaut walking on moon with equal magnitude will do movements with different velocity as compared to astronaut walking on earth due to different speed of time.

In our research paper, I have mentioned all the factors and quantities on which the speed of time in celestial body depends. We have experimental examples and calculated proofs about my concept (including important formula for calculating speed of time in different planets). The formula of speed of time has expressed the value of speed of time in numerical value with suitable units, symbols and dimensions which are proving 100 % applicable on planets. My concept has revealed various answers about different time speeds occurring in different planets or celestial bodies and could also help us in understanding the nature of time more efficiently. To make this research possible, we have first studied the nature of time in a planet, observed the movements of various planets, collected all data and factors affecting speed of time, conducted several experiments (which is mentioned in my research paper) and finally created an equation/formula for speed of time on a planet.

It will be our extreme honor, if higher authorities such as scientists, researchers, experts, explorers and innovative minds will read our concept, refer it for future use and suggest changes if any.

Corresponding Author:- Shreerang.

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Introduction:-

INTRODUCTION TO THE SPEED OF TIME (SHREST THEORY) & KEY TERMS USED IN THE RESEARCH

- General introduction: - The main motive of this research is to derive the formula/equation of speed of time on celestial bodies (especially planets, stars). But first of all, let`s understand the concept of speed of time. The speed of time on celestial/planetary is my new concept which can be simply explained as: - Imagine you have landed on a certain planet, and stay there for some time. And after that you`ve gone to other planet, whose size is different from the first planet. In both these cases, you will observe that the time is running at different speed, rate or interval. Or you will experience different time speed in both these planets (i.e. time is running faster on one planet or slower on another). This concept is known as the speed of time on a planet (also called as shrest theory).

For example, (a) If you run or walk on two different planets with same magnitude, you will find that you are taking different time to reach the destination (one will reach sooner, while other will reach later).

(b) If you are throwing exactly same ball on the aim with same magnitude on two different planets, then you will observe that the ball will hit the aim by taking different time (i.e. one will hit earlier and other will hit later) due to different value of speed of time in those two planets.

(c) Astronaut walking on moon with equal magnitude will do movements with different velocity as compared to astronaut walking on earth due to different speed of time.

This concept can help us to understand the nature of time on planetary objects more clearly & physically. This concept also explains how various factors affect the speed of time.

The following key terms should be kept in mind to understand this concept & research more clearly:-

1. If the value of speed of time is more, then the time is running at faster rate/high speed in that planet.
2. If the value of speed of time is less, then the time is running at slower rate/low speed in that planet.
3. If the object/body is taking more time in a planet when equal magnitude is applied by the object/body, then the speed of time is less on that planet.
4. If the object/body is taking less time in a planet when equal magnitude is applied by the object/body, then the speed of time is high/more on that planet.
5. The speed of time is denoted by the symbol T_s.
6. In my research paper, the unit of speed of time is named as 'shrest'. It is denoted by the symbol S_r.
7. The value of speed of time is rounded off approximately up to 3 digits after the decimal point to make it more precise & accurate.
   i.e. = $0.548703495 \times (10)^{24} \approx 0.549 \times (10)^{24}$
8. The unit shrest (S_r) is represented in the MKS (meter, kilogram, second) system in this research paper.

FACTORS AFFECTING THE SPEED OF TIME AND OBSERVATIONS FROM EXAMPLES OR EXPERIMENTS

The value of speed of time in every celestial or planetary body is never same/ equal. It depends on various factors/ quantities. It may change its characteristics/ properties if one quantity is neglected/ added. Now we will observe the factor which affects the speed of time in planetary or celestial objects through practical experiment, thought experiments and examples:-

1) Mass of the planet (m):- Consider two planets A and B (neglecting its acceleration due to gravity and air resistance). Planet A has larger mass than Planet B and now both the planets are made to rotate at a constant velocity. But as mass (m) and velocity (v) has an inverse relation (as $m = \frac{p}{v}$ and $m = \frac{Ft}{v}$). So, Planet A will begin to rotate with low velocity and Planet B will rotate with high velocity.

Now, we will do an experiment. Launch a space craft satellite A and satellite B (having an atomic clock) on both the planets having larger mass(Planet A) and smaller mass(Planet B), respectively. Allow the satellite to move relative around the Planet A and B, respectively. Planet B is rotating at higher velocity. So, in order to move relative to Planet B, the satellite B had to move with the velocity higher than the rotational velocity of Planet B. Thus, Satellite B has to revolve at higher velocity. On the other hand, Planet A is rotating with low velocity and Satellite A also had to move with the velocity higher than the rotational velocity of Planet A in order to move relative to it. But Satellite B will move with high relative velocity as compared to satellite A (as Planet A and Planet B are taken as point of reference/ reference point). Now according to the concept of time dilation, the faster the relative velocity, the greater the time dilation. And due to the greater time dilation in Satellite B (due to its high relative velocity), satellite B will experience a slow time or time will slow down in Satellite B. While in Satellite A, time will be faster than Satellite B. From this experiment, we can now firmly say that time on Planet A is faster and time on Planet B is running slowly. As the time is running faster on Planet A, the speed of time on Planet A is high. And as the time is running slower on Planet B, the speed of time on Planet B is low.

From this experiment, we can conclude that:- "The speed of time (T_s) is directly proportional to the mass of the planet (m)."
$T_s \propto m$
, (as the Planet A has higher mass than Planet B)
As the mass of a planet or celestial body increases, its speed of time also increases and vice versa.
(Note: Refer Fig.1.1 in the illustrations)
2) Acceleration due to gravity of the planet (g):- Consider two Planets A and B. Planet A has more acceleration due to gravity than Planet B (neglecting air resistance).

Now imagine that there is a road A and road B of same length in Planet A and Planet B, respectively (neglecting air resistance). Now a boy is running on the road of both Planet A and B. The boy is applying same force/ magnitude to run at same speed on both the roads. But the acceleration due to gravity on road A is more than road B. And due to more acceleration due to gravity on road A, the boy will experience greater downward force on road A, due to which his speed will slow down in road A. On the other hand, his speed will be relatively faster on Planet B (as value of acceleration due to gravity on Planet B is smaller than Planet A). As the speed of boy on road A slows down, it will take more time to complete road A of same length and as the value of acceleration due to gravity is smaller on road B & his speed is high, so it will take less time to cover road B of same length.

Now as in road A of Planet A, the boy is taking more time to complete the road, so it can be firmly said that the time has slow down in Planet A. So, the speed of time on Planet A is less or time is running slowly on Planet A. And as in road B, he is taking less time to complete the road. Thus, the speed of time on Planet B is more or time is running fast on Planet B.

We can also take the example of a car i.e. set the cat to move with constant velocity/magnitude on both road A & road B. You will observe that speed of the car will slow down in road A & will take more time to complete the road. While in road B, the car will take less time to complete. And finally, the result will be same in every case that speed of time on Planet A is less than speed of time on Planet B.

From this experiment/ example, we can conclude that:- "The speed of time (T_s) is inversely proportional to the acceleration due to gravity of the planet (g)."
$T_s \propto \frac{1}{g}$
, (as Planet A has more acceleration due to gravity than Planet B)
As the acceleration due to gravity of the planet or celestial body increases, its speed of time decreases and vice versa.
(Refer Fig.1.2 in the illustrations)

Alternative Proof:-
Planet A has more acceleration due to gravity than Planet B. Due to more acceleration due to gravity on Planet A, it will have a high gravitational field. While Planet B will have a low gravitational field. Now according to gravitational time dilation, an observer/ body under the influence of high gravitational field will experience that time

has slow down. For example, time will slow down near a black hole because gravitational field is extremely high near it leading to large gravitational time dilation.

Time will slow down more in a high gravitational field as compared to the low gravitational field. Now as Planet A has high gravitational field and Planet B has low gravitational field. So, time will slow down in Planet A and time will pass quickly in Planet B (as compared to Planet A). Thus, the speed of time on Planet A is low and the speed of time on Planet B is high.

From this concept, we can also conclude that "the speed of time (T_s) is inversely proportional to the acceleration due to gravity of the planet (g)."

$T_s \propto \frac{1}{g}$

3) Rotational velocity of the planet (v_r):- Consider Planet A has larger mass and Planet B has smaller mass (neglecting its acceleration due to gravity). Now as I have proved that Planet A will rotate with low velocity and Planet B will rotate with high velocity. So, Planet A rotating with low velocity will have high speed of time. While Planet B rotating with high velocity will have less speed of time.

So, when acceleration due to gravity (g) is neglected, then the speed of time is inversely proportional to the rotational velocity of the planet (v_r).

$T_s \propto \frac{1}{v_r}$

Derivation of the equation for the speed of time on a planet/celestial body and values of speed of time for planets in the solar system

*Derivation:-

I have proved that: - "The speed of time on a planet (T_s) is directly proportional to the mass of the planet (m)."

$T_s \propto m$

I have also proved that: - "The speed of time on a planet (T_s) is inversely proportional to the acceleration due to gravity (g).

$T_s \propto \frac{1}{g}$

From the analysis of mass and acceleration due to gravity of various planets, it is easily observed that a planet having larger mass has more acceleration due to gravity and a planet having smaller mass has less acceleration due to gravity. For example, acceleration due to gravity on Earth is more than its Moon because earth's mass is larger than moon. Acceleration due to gravity on Jupiter is more than Mars because Jupiter's mass is larger than Mars.

So, it is easily concluded that the "mass of the planet (m) is directly proportional its acceleration due to gravity (*g)".*

$$m \propto g \qquad \text{.........(1)}$$

Now as speed of time is directly proportional to the mass of the planet and inversely proportional to the acceleration due to gravity. We can now take $\mathfrak{J}$ as a constant to remove the proportionality sign in equation (1). So,

$m = T_s g$

$$T_s = \frac{m}{g} \qquad \text{......... (A)}$$

Note:- We cannot place the rotational velocity (v_r) in the equation (A) as $T_s = \frac{m}{g v_r}$. This is because speed of time (T_s) is inversely proportional to rotational velocity, only when the acceleration due to gravity of a planet is neglected. But here we cannot neglect acceleration due to gravity as the planet has mass and if mass exists, then its acceleration due to gravity must exist.

Another reason is that if we further solve the equation $T_s = \frac{m}{g v_r}$, then we will get $T_s = \frac{mt^3}{r^2}$ (where m = mass, t = time, r = distance) or $[L^{-2}M^1T^3]$ dimensionally, but this equation shows r^2 which denotes the distance between two planets/ celestial bodies. But we are calculating the value of speed of time for a single planet. So, we cannot use the equation $T_s = \frac{m}{g v_r}$ for calculating the speed of time on a celestial body/ planet. On the other hand, if we further solve the equation $T_s = \frac{m}{g}$, then we will get $T_s = \frac{mt^2}{r}$ (where m = mass, t = time, r = distance) which show r for a single planet/ celestial body and satisfies our parameters. So, equation $T_s = \frac{m}{g}$ is correct and we can use this equation for calculating the value of speed of time on a planet/ celestial body.

So finally, the equation for the speed of time on a planet/ speed of time, mass of a planet and acceleration due to gravity of a planet relation/ Shrest equation is given by :-

$T_s = \frac{m}{g}$

Where, T_s = speed of time on a planet/ celestial body

m = mass of the planet

g = acceleration due to gravity of a planet

- The unit of speed of time (T_s) is shrest (S_r).
- 1 shrest = $\frac{1 \text{ kilogram} \times 1 \text{ second} \times 1 \text{ second}}{1 \text{ meter}}$
- The dimensions of the speed of time $[T_s] = [L^{-1}M^{1}T^{2}]$

*Now let's calculate the value of speed of time of the planets in the solar system.

1) Speed of time on Earth:-

Mass of the earth (m) = $5.972 \times (10)^{24}$ Kg , acceleration due to gravity on earth $g = 9.8\ ms^{-2}$

$T_s = \frac{m}{g}$

$T_s = \frac{5.972 \times (10)^{24}}{9.8}$

$T_s = \frac{5.972}{9.8} \times (10)^{24}$

$T_s = 0.609387755102 \times (10)^{24}\ S_r$

$T_s = 0.609 \times (10)^{24}\ S_r$ …..(approx.)

Thus, the value of speed of time on Earth is $0.609 \times (10)^{24}\ S_r$.

2) Speed of time on Jupiter:-

m = $1898 \times (10)^{24}$ Kg , $g = 24.5\ ms^{-2}$

$T_s = \frac{m}{g}$

$T_s = \frac{1898 \times (10)^{24}}{24.5}$

$T_s = \frac{1898}{24.5} \times (10)^{24}$

$= 77.4693877 \times (10)^{24}$

$T_s = 77.469 \times (10)^{24}\ S_r$ ………(approx.)

Thus, the value of speed of time on Jupiter is $77.469 \times (10)^{24}\ S_r$.

3) Speed of time on Mars:-

m = $0.639 \times (10)^{24}$ Kg , $g = 3.8\ ms^{-2}$

$T_s = \frac{m}{g}$

$T_s = \frac{0.639 \times (10)^{24}}{3.8}$

$= \frac{0.639}{3.8} \times (10)^{24}$

$T_s = 0.16815789473 \times (10)^{24}\ S_r$

$T_s = 0.168 \times (10)^{24}\ \mathcal{S}$ ………(approx..)

Thus, the value of speed of time on Mars is $0.168 \times (10)^{24}\ S_r$.

4) Speed of time on Mercury:-

m = $0.3285 \times (10)^{24}$ Kg , $g = 3.61\ ms^{-2}$

$T_s = \frac{m}{g}$

$T_s = \frac{0.3285 \times (10)^{24}}{3.61}$

$= \frac{0.3285}{3.61} \times (10)^{24}$

$T_s = 0.090997229916 \times (10)^{24}\ S_r$

$T_r = 0.091 \times (10)^{24}\ S_r$ ……….(approx.)

Thus, the value of speed of time on Mercury is $0.091 \times (10)^{24}\ S_r$.

5) Speed of time on Venus:-

m = $4.867 \times (10)^{24}$ Kg , $g = 8.87\ ms^{-2}$

$T_s = \frac{m}{g}$

$T_s = \frac{4.867 \times (10)^{24}}{8.87}$

$= \frac{4.867}{8.87} \times (10)^{24}$

$T_s = 0.54870349492 \times (10)^{24} S_r$

$T_s = 0.549 \times (10)^{24} S_r$ ……..(approx.)

Thus, the value of speed of time on Venus is $0.549 \times (10)^{24} S_r$.

6) Speed of time on Uranus:-

$m = 86.81 \times (10)^{24}$ Kg , $g = 8.69\ ms^{-2}$

$T_s = \frac{m}{g}$

$T_s = \frac{86.81 \times (10)^{24}}{8.69}$

$= \frac{86.81}{8.69} \times (10)^{24}$

$= 9.989643268124 \times (10)^{24}$

$T_r = 9.990 \times (10)^{24} S_r$ ………(approx.)

Thus, the value of speed of time on Uranus is $9.990 \times (10)^{24} S_r$.

7) Speed of time on Neptune:-

$m = 102.4 \times (10)^{24}$ Kg , $g = 11.15\ ms^{-2}$

$T_s = \frac{m}{g}$

$T_s = \frac{102.4 \times (10)^{24}}{11.15}$

$= \frac{102.4}{11.15} \times (10)^{24}$

$T_s = 9.183856502242 \times (10)^{24}$

$T_s = 9.184 \times (10)^{24} S_r$

Thus, the value of speed of time on Neptune is $9.184 \times (10)^{24} S_r$.

- For example, an astronaut/ body/ observer will experience $77.469 \times (10)^{24} S_r$ speed of time in planet Jupiter and $0.168 \times (10)^{24} S_r$ in Mars & so on. So, by the values of speed of time he/ she can know more precisely at what speed the time is running in various planets.

My assumptions/ predictions about this research is :- the magnitude/ value of speed of time (T_s) is quite high. It is difficult to go beyond time but never be impossible. I believe that time travel is possible. I will suggest the scientists to do time travel experiment on a planet which has less mass so it can be easy to go backward or beyond time. The speed of time can be affected if external bodies such as asteroids, meteorites is added to the mass of the planet or mass of the planet is removed (by some reasons). According to my assumption, the speed of time in vacuum space is zero (as there is no mass and acceleration due to gravity), unless a body/ object enters in that vacuum space. The time is not same/ constant in in every part of the universe i.e. speed of time directly depends on the mass of the body and inversely depends on the acceleration due to gravity of the body.

Illustrations

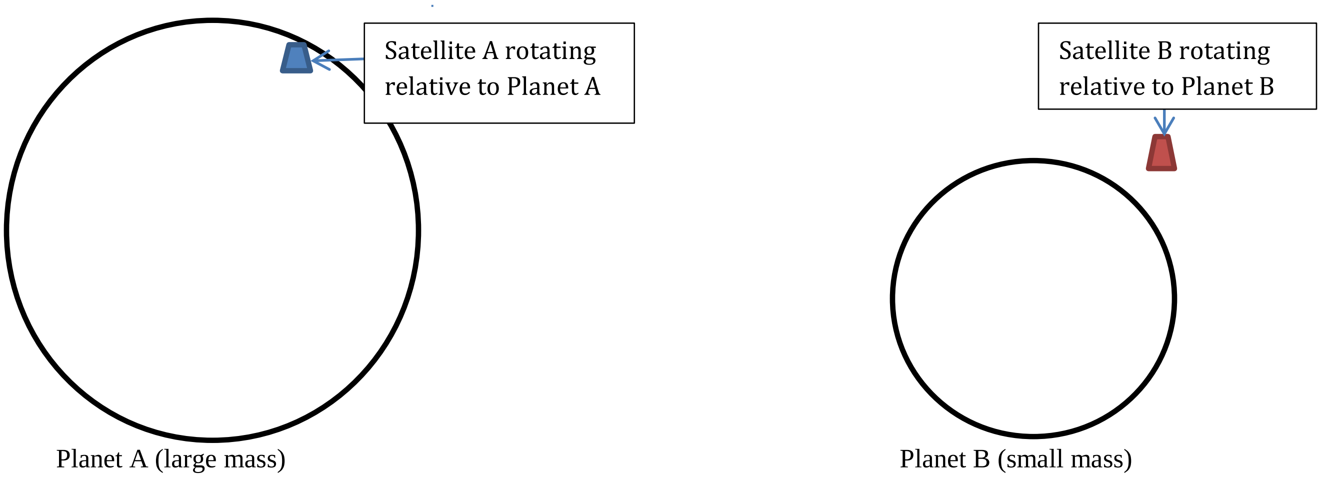

Fig.1.1:- illustrating how mass of the planet affects its speed of time.

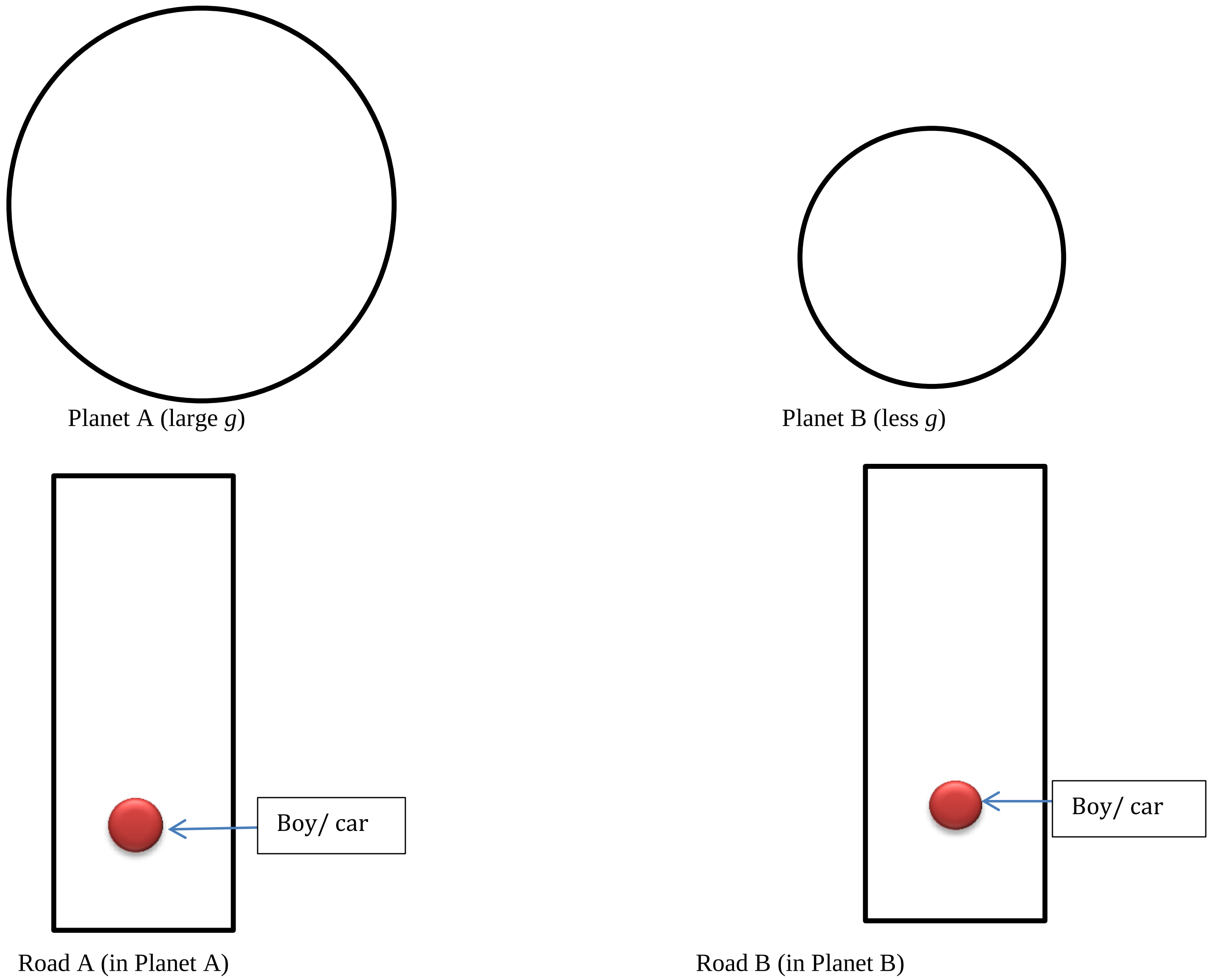

Fig.1.2:- illustrating how acceleration due to gravity of the planet affects its speed of time.

Acknowledgement:-

I Shreerang Narayankar, greatly acknowledge my college & institution NCRD's N.E.M.S. & junior college, Manchar. I specially acknowledge my chemistry teacher/ mentor, Professor & Scientist Mr. S.T. Shinde who supported, guided and suggested me to publish this research. I would also like to acknowledge my parents who given me freedom to do this research work. I would also like to acknowledge my friend Kaushal Shinde who shares interesting ideas and facts with me.

Conclusion:-

This concept helps in understanding the nature of time more efficiently. The scientists and physicists can use the ideas of this concept/ equation to use it in time travel experiments/ experiments related to time. The speed of time is not constant/ same in every part of the universe. Speed of time directly depends on the mass of the planet and inversely depends on the acceleration due to gravity of the planet. The speed of time on a planet is affected when the mass of the planet is increased or decreased. The speed of time in vacuum space is zero, unless a body/ object enters the vacuum space. The shrest equation gives the value of speed of time of a planet/ celestial body. Speed of time represents at what speed the time is running/ passing on a planet/ celestial body. The larger value of the speed of time indicates that time is running/ passing quickly on a planet/body, whereas less value of speed of time indicates that time is running/ passing slowly on a planet/ body. The shrest equation represents the nature of time more precisely & physically.

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