THE LAW OF MOTION

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ABSTRACT

INERTIA OF MOTION –
A body is at motion, as long as the applied force on it , converts to the centripetal force as well as the centrifugal force .

INERTIA OF REST –
A body is at rest, until the applied force on it , converts to the centripetal force as well as the centrifugal force .

KEY WORDS -
Absorption, Action, Inertia, Motion, Rest, Reaction, Centripetal force and centrifugal force

INTRODUCTION

Action means the force exerts on the second body by the first body. Reaction means the force exerts on the first body by the second body.Absorption means the force absorbed in the second body .When a force is applied on a body, the body moves some distance .That is, by the action on the body, the body moves some distance by its reaction and absorption .So the relation of action, absorption and reaction is obtained from the motion of a body. Everybody moves on a curved path to cover a straight line path .

A deer jumps in a curved path to cover a straight line path. A frog jumps in a curved path to cover a straight line path. A bird flies in the air making curves by its wings. A fish swims in the water making curves by its fins. A stone thrown into the sky , moves in a curved path to cover a straight line path on the earth. Snake moves on the ground by making many curves to cover a straight line path. Water flows in the river by making numerous curves to cover a straight line path. While walking, every foot of a man moves in a curved path to cover a straight line path.When a man rides a bicycle, his two feet rotate on the two paddles of the cycle to cover a distance . The following motion law is derived from the above type of motions.

LAW OF MOTION - EVERYBODY MOVES VERTICALLY ON A CURVED PATH TO COVER HORIZONTALLY ON A STRAIGHT LINE PATH IN A ROTATION

Straight line path=$2\pi a$
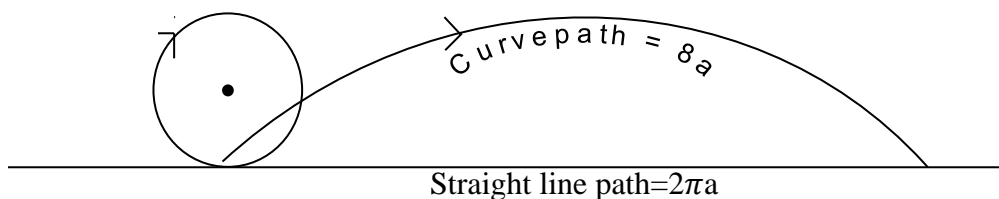
SUBJECT MATTER

Motion is rotation and vice-versa . When a force is applied to a wheel, the wheel rolls on a road so that every point on it which touches the road moves vertically in a curved path to cover

horizontally on a straight line path in its every rotation .The curved path is a cycloid, Whose length is calculated by the length formula of calculus as '8a' and the length of the horizontal straight line path is 2πa where 'a' is the radius of the circle which generates the cycloid .

As the point on the wheel moves on a cycloid path which is the part of a circular path, so the centripetal force acts on it. Centripetal force is a force, which is required to move a body uniformly on a circle. This force acts along the radius and towards the centre of the circle. While moving along a circle the body has a constant tendency to regain its natural straight line path .This tendency gives rise to a force, which is called the centrifugal   force .It acts along the radius and away from the centre of the circle .Centripetal force is the action force and centrifugal force is the combination of absorption force and reaction force. The centripetal force and the centrifugal force are equal in magnitude and opposite in directions. So where is centripetal force, there is centrifugal force also.

 Every point on the wheel moves vertically '8a' length by the centripetal force
 but simultaneously the same point covers 2πa length horizontally by the centrifugal force.

Suppose s_1= length of the cycloid path   and s_2 = length of the straight line path .

So s_1 = 8a and $s_2 = 2\pi$a, Here 8a $> 2\pi$a $=> s_1 > s_2$. Let v_1= Velocity of any point on the cycloid path $= \frac{ds_1}{dt}$.   And v_2= Velocity of the same point on the straight line path $= \frac{ds_2}{dt}$

As $s_1 > s_2 => \frac{ds_1}{dt} > \frac{ds_2}{dt}$ so $v_1 > v_2 => mv_1 > mv_2 => m\frac{dv_1}{dt} > m\frac{dv_2}{dt}$ So m$a_1 >$ ma_2

where $\frac{dv_1}{dt} = a_1$ and $\frac{dv_2}{dt} = a_2$ .Hence $F_1 > F_2$ where $F_1 =$ ma_1 and $F_2 =$ ma_2

Here F_1 = **CENTRIPPETAL FORCE** ,

Which is applied on the point of the wheel, So it moves 8a length on the cycloid path.

The magnitude of the centripetal force is equal to the magnitude of the centrifugal force.

Here F_2 + **SOME ABSORBED FORCE = CENTRIFUGAL FORCE**,

Which is utilized on the Straight line path.

So $F_1 = F_2$ + **SOME ABSORBED FORCE,**   As $F_1 > F_2$.

 This implies that,

ACTION FORCE = REACTION FORCE + ABSORPTION FORCE.

I. INERTIA OF MOTION

Inertia of motion takes place in a wheel , When a force is applied on it , so that the applied force converts to the centripetal force as well as the centrifugal force , as a result the wheel rotates and moves on the road .When a wheel rotates on the road ,every point on it moves on a cycloid path to cover a straight line path .Simultaneously the centripetal force acts on the cycloid path and the centrifugal force acts on the straight line path .
We have the motion law as follows.

Action = Reaction + Absorption   , Here   **Absorption > 0**
         As **Absorption > 0** , Hence   **Action > Reaction**

So   when absorption > 0 , then the body will be at motion ,
Which is called the inertia of motion of the body

This law implies that ,
A body is at motion , as long as the applied force on it , converts to the centripetal force
as well as the centrifugal force .

II. INERTIA OF REST

Inertia of rest takes place in a wheel , When a force is applied on the wheel, so that the applied force can not convert to the centripetal force as well as the centrifugal force , as a result the wheel can neither rotate nor move .
We have the motion law as follows ,

Action = Reaction+Absorption   ,

When   Absorption $= 0$ in the above equation , then   Action $=$ Reaction $+ 0 =$ Reaction ,

Hence   **Action = Reaction**   As   Absorption $= 0$

So when   Action $=$ Reaction , then the body will be at rest   ,

which is called the inertia of rest of the body.

This law implies that ,
A body is at rest , until the applied force on it , converts to the centripetal force as well as
the centrifugal force .

Figure	Caption	Meaning	Value
1	**Cycloid**	It is a curved path ,that is traced out by a point on a circle, Which rolls on a straight line .	**8a = Length of the cycloid**
2	**Straight line**	Length of the circumference of a circle	**$2\pi a$**
3	**A**	Radius of the circle	**$2\pi a/2\pi$**
4	**π**	Circumference of a circle/diameter	**22/7 = 3.14159**
5	**Circle**	A circle is a locus of a point whose distance from a fixed point is constant	