

ACCELERATION OF A BODY IS DIRECTLY PROPORTIONAL TO THE RESULTANT FORCE AND INVERSELY PROPORTIONAL TO ITS MASS

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ABSTRACT

Rotation is motion and vice versa .Every point of a wheel moves simultaneously in a vertical curved path as well as a horizontal straight line path in a rotation . If a force is applied on a wheel and that force simultaneously converts to the centripetal force as well as the centrifugal force then the wheel moves forward. So everybody moves vertically in a curved path to cover horizontally on a straight line path. The following law is derived from the above fact as follows

“THE FORCE OF ACTION IS ALWAYS EQUAL TO THE SUM OF OPPOSITE REACTION AND ABSORPTION”

This implies that **“14 PARTS ACTION = 11 PARTS REACTION + 3 PARTS ABSORPTION “**

which means, when 14 parts of a force is applied to a wheel then simultaneously 3 parts of the force absorbs on the road and the rest 11 parts of the force makes the wheel to move forward .The following law is derived from the above fact as follows

LAW : THE ACCELERATION OF A BODY IS DIRECTLY PROPORTIONAL TO THE RESULTANT FORCE AND INVERSELY PROPORTIONAL TO ITS MASS

The following equation is derived from the above law

$$\text{Force} = (11/14) \text{ mass} * \text{acceleration}$$

where (11/14) is the constant of proportionality

KEY WORDS : Absorption, Action, Reaction, Centripetal force, Centrifugal force , Force Mass , Acceleration , Constant of proportionality , Cycloid .

INTRODUCTION

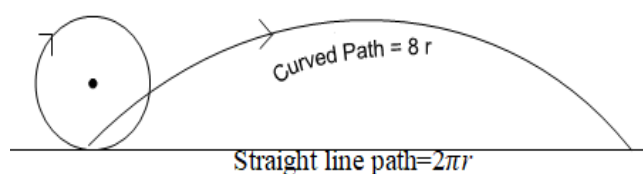
Action means, the force exerts on the second body by the first body. Reaction means, the force exerts on the first body by the second body. Absorption means, the amount of force is absorbed in the second body .When a force is applied on a body and that applied force simultaneously converts to the centripetal force and centrifugal force then the body moves some distance.

That is, by the action on the body, the body moves some distance by its reaction and absorption .

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 in the air, moves in a curved path to cover a straight line path.

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 rotates to move simultaneously in a curved path and a straight line path.

The wheel of a vehicle moves uniformly on a road. So the action, absorption and reaction relation can be derived accurately from the motion of a wheel on the road.



SUBJECT MATTER

When a force is applied to a wheel, the wheel rolls on the road so that every point on it which touches the road moves vertically on a cycloid path to cover horizontally on a straight line path in its every rotation. The cycloid is a curved path, which is traced out by a point on a circle that rolls on a straight line. The length of the cycloid is calculated by the length formula of calculus as $8r$ and the length of the horizontal straight line path is $2\pi r$, where r is the radius of the circle which generates the cycloid.

Every point rotates on the wheel to move vertically on a cycloid path, which is a part of the circular path, hence 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 reaction along with absorption 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 $8r$ length by the centripetal force and simultaneously the same point covers $2\pi r$ length horizontally by the centrifugal force.

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

$$\text{So } s_1 = 8r \text{ and } s_2 = 2\pi r$$

$$\text{Here } 8r > 2\pi r \Rightarrow s_1 > s_2$$

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 = $\frac{ds_2}{dt}$

$$\text{As } s_1 > s_2 \Rightarrow \frac{ds_1}{dt} > \frac{ds_2}{dt} \text{ So } v_1 > v_2$$

$$\Rightarrow mv_1 > mv_2 \Rightarrow m \frac{dv_1}{dt} > m \frac{dv_2}{dt}$$

$$\Rightarrow ma_1 > ma_2 \text{ So } F_1 > F_2$$

$$\text{where } \frac{dv_1}{dt} = a_1, \frac{dv_2}{dt} = a_2,$$

$$F_1 = ma_1 \text{ and } F_2 = ma_2$$

Here F_1 = **CENTRIPETAL FORCE**,

Which is applied on the point of the wheel, So it moves $8r$ length on the cycloid path. The magnitude of the centripetal force is equal to the magnitude of the centrifugal force.

Hence $F_1 = F_2 + \text{SOME ABSORBED FORCE}$

As $F_1 > F_2$

So $F_2 + \text{SOME ABSORBED FORCE} = \text{CENTRIFUGAL FORCE}$

Centrifugal force is utilized on the Straight line path, as a result absorption and motion takes place simultaneously there .

This implies that

**ACTION FORCE =
REACTION FORCE + ABSORPTION FORCE**

**ACTION OF CENTRIPETAL FORCE :
REACTION OF CENTRIFUGAL FORCE**
 $= 8r : 2\pi r = 8 : 2\pi = 8 : (2 * 22/7)$
 $= (8 * 7/7) : (2 * 22/7) = 56/7 : 44/7$
 $= 56 : 44 = 14 : 11$

This implies that, “ TO EVERY 14 PARTS OF ACTION , THERE IS 11 PARTS OF REACTION ”

The magnitude of the centripetal force is equal to the magnitude of the centrifugal force . So each one of centripetal force as well as the centrifugal force must do equal amount of work .But here centripetal force does more work than the centrifugal force,

this implies that some amount of centrifugal force is absorbed on the road .

Hence 14 PARTS ACTION – 11 PARTS REACTION = 3 PARTS ABSORPTION

To every 14 parts of action, there is 11 parts of reaction and 3 parts of absorption .

This implies that **14 PARTS ACTION = 11 PARTS REACTION + 3 PARTS ABSORPTION**

So **1 part action = (11/14) part reaction + (3/14) part absorption**

This implies that

ACTION = REACTION + ABSORPTION

The law states that

THE ACCELERATION OF A BODY IS DIRECTLY PROPORTIONAL TO THE RESULTANT FORCE AND INVERSELY PROPORTIONAL TO ITS MASS

Let F = Resultant force ,which makes the body to move

m = mass of the body

and a = acceleration of the body .

Mathematically the above law states that

Acceleration of the body is directly proportional to the resultant Force

i.e. $a \propto F$ -----(1)

and also

Acceleration of the body is inversely proportional to the mass

i.e. $a \propto (1/m)$ -----(2)

Combining the above two equations

(1) and (2) it is obvious that

Acceleration of the body is directly proportional to (Force / mass)

i.e. $a \propto F * (1/m) = (F/m)$

Its converse is also true

So (Force / mass) is directly proportional to acceleration of the body

i.e. $(F/m) \propto a$

This implies that

Force is directly proportional to

(mass * acceleration)

i.e. $F \propto (m * a)$

Now $F \propto (m * a) \Rightarrow$
Force = Constant(mass*acceleration)

Constant = Constant of proportionality

If a force is applied on a wheel and that force simultaneously converts to the centripetal force as well as the centrifugal force then the wheel moves forward. Every point of the wheel moves on the cycloid path by the centripetal force and that point simultaneously moves on the straight line path by the centrifugal force. So the centrifugal force is responsible for the motion as well as absorption .

It is obtained that

1 part action = (11/14) part reaction + (3/14) part absorption

So it is obvious that

1 part of the centrifugal force = (11/14) part of the centrifugal force used for motion + (3/14) part of the centrifugal force used for absorption .

Out of 1 part of the centrifugal force , (11/14) part of the centrifugal force is used for the motion of the body and simultaneously the rest (3/14) part of the centrifugal force is used for the absorption purpose in that medium. It is obvious that without absorption, there is no motion.

As (11/14) part of the centrifugal force is used only for the motion purpose out of the 1 part of the centrifugal force , Hence

Constant of proportionality = (11/14)
= Constant = C = (11/14)

It is obvious that

Force = C * (mass * acceleration)

This implies that

Force =
(11/14) mass * acceleration

Hence **F = (11/14) m * a**

THIS IS THE ACTUAL RESULTANT FORCE ,WHICH DOES THE WORK .

Figure	Caption	Meaning	Value
1	Cycloid	Cycloid is a curved path , that is traced out by a point on a circle, which rolls on a straight line .	8r = Length of the cycloid
2	Straight line	Length of the circumference of a circle = Length of the horizontal straight line	2πr
3	r	Radius of the circle	2πr/2 π
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	