UNIT 1

NATURE OF PHYSICAL WORLD AND MEASUREMENT

I. Multiple Choice Questions

K SARAVANAN GHSS KORAKKAI

1. One of the combinations from the fundamental physical constants is $\frac{hc}{G}$. The unit of this expression is

a) kg^2 b) m^3

c) s^{-1} d) m

2. If the error in the measurement of radius is 2%, then the error in the determination of volume of the sphere will be

a) 8% b) 2%

c) 4% d) 6%

3. If the length and time period of an oscillating pendulum have errors of 1% and 3% respectively then the error in measurement of acceleration due to gravity is

a) 4% [Related to AMPMT 2008]

b) 5%

c) 6%

d) 7%

4. The length of a body is measured as 3.51 m, if the accuracy is 0.01mm, then the percentage error in the measurement is

a) 351% b) 1%

c) 0.28% d) 0.035%

5. Which of the following has the highest number of significant figures?

a) 0.007 m^2

b) 2.64×10^{24} kg

c) 0.0006032 m^2

d) 6.3200 J

6. If $\pi = 3.14$, then the value of π^2 is

a) 9.8596 b) 9.860

c) 9.86 d) 9.9

7. Which of the following pairs of physical quantities have same dimension?

a) force and power

b) torque and energy

c) torque and power

d) force and torque

8. The dimensional formula of Planck's constant h is [AMU, Main, JEE, NEET]

a) $[ML^2T^{-1}]$ b) $[ML^2T^{-3}]$

c) $[MLT^{-1}]$ d) $[ML^3T^{-3}]$

9. The velocity of a particle v at an instant t is given by $v = at + bt^2$. The dimensions of b is

a) [L] b) $[LT^{-1}]$

c) $[LT^{-2}]$ d) $[LT^{-3}]$

10. The dimensional formula for gravitational constant G is [Related to AIPMT 2004]

a) $[ML^3T^{-2}]$ b) $[M^{-1}L^3T^{-2}]$

c) $[M^{-1}L^{-3}T^{-2}]$ d) $[ML^{-3}T^2]$

11. The density of a material in CGS system of units is 4 g cm^{-3} . In a system of units in which unit of length is 10 cm and unit of mass is 100 g, then the value of density of material will be

a) 0.04 b) 0.4

c) 40 d) 400

12. If the force is proportional to square of velocity, then the dimension of proportionality constant is [JEE-2000]

a) $[MLT^0]$ b) $[MLT^{-1}]$

c) $[ML^{-2}T]$ d) $[ML^{-1}T^0]$

www.Padasalai.Net

http://www.trbtnpsc.com/2018/06/latest-plus-one-11th-study-materials-tamil-medium-english-medium-new-syllabus-based.html

13. The dimension of $\left(\mu_0\varepsilon_0\right)^{-\frac{1}{2}}$ is
[Main AIPMT 2011]

(a) length (b) time

(c) velocity (d) force

14. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are taken as three fundamental constants. Which of the following combinations of these has the dimension of length?.
[NEET 2016 (phase II)]

(a) $\frac{\sqrt{hG}}{c^{\frac{3}{2}}}$ (b) $\frac{\sqrt{hG}}{c^{\frac{5}{2}}}$

(c) $\sqrt{\frac{hc}{G}}$ (d) $\sqrt{\frac{Gc}{h^{\frac{3}{2}}}}$

15. A length-scale (l) depends on the permittivity (ε) of a dielectric material, Boltzmann constant (k_B), the absolute temperature (T), the number per unit volume (n) of certain charged particles, and the charge (q) carried by each of the particles. Which of the following expression for l is dimensionally correct?. [JEE (advanced) 2016]

(a) $l=\sqrt{\frac{nq^2}{\varepsilon k_B T}}$

(b) $l=\sqrt{\frac{\varepsilon k_B T}{nq^2}}$

(c) $l=\sqrt{\frac{q^2}{\varepsilon n^{\frac{2}{3}} k_B T}}$

(d) $l=\sqrt{\frac{q^2}{\varepsilon n k_B T}}$

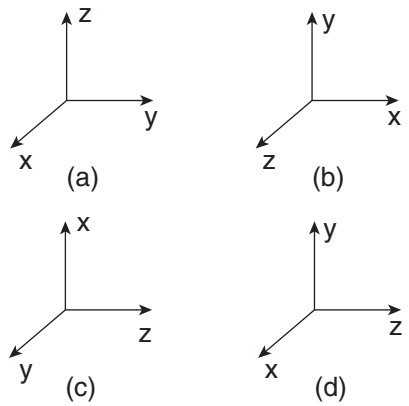
www.Padasalai.Net

UNIT 2

KINEMATICS

I. Multi Choice Question

1. Which one of the following Cartesian coordinate systems is not followed in physics?



2. Identify the unit vector in the following.

(a) $\hat{i}+\hat{j}$ (b) $\frac{\hat{i}}{\sqrt{2}}$

(c) $\hat{k}-\frac{\hat{j}}{\sqrt{2}}$ (d) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

3. Which one of the following physical quantities cannot be represented by a scalar?

(a) Mass

(b) length

(c) momentum

(d) magnitude of acceleration

4. Two objects of masses m_1 and m_2 fall from the heights h_1 and h_2 respectively. The ratio of the magnitude of their momenta when they hit the ground is (AIPMT 2012)

(a) $\sqrt{\frac{h_1}{h_2}}$ (b) $\sqrt{\frac{m_1 h_1}{m_2 h_2}}$

(c) $\frac{m_1}{m_2}\sqrt{\frac{h_1}{h_2}}$ (d) $\frac{m_1}{m_2}$

5. If a particle has negative velocity and negative acceleration, its speed

(a) increases (b) decreases

(c) remains same (d) zero

6. If the velocity is $\vec{v}=2\hat{i}+t^2\hat{j}-9\vec{k}$, then the magnitude of acceleration at t = 0.5 s is

(a) 1m s^{-2} (b) 2 m s^{-2}

(c) zero (d) -1 m s^{-2}

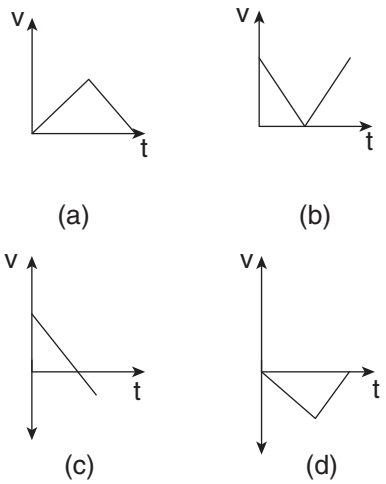
7. If an object is dropped from the top of a building and it reaches the ground at t = 4 s, then the height of the building is (ignoring air resistance) (g = 9.8 ms^{-2})

(a) 77.3 m (b) 78.4 m

(c) 80.5 m (d) 79.2 m

www.Padasalai.Net

8. A ball is projected vertically upwards with a velocity v. It comes back to ground in time t. Which v-t graph shows the motion correctly? (NSEP 00-01)



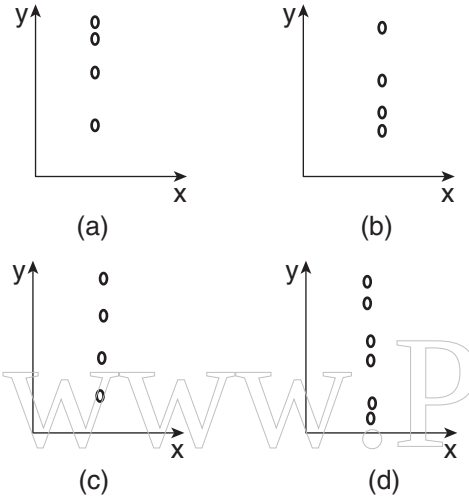
http://www.trbtnpsc.com/2018/06/latest-plus-one-11th-study-materials-tamil-medium-english-medium-new-syllabus-based.html

9. If one object is dropped vertically downward and another object is thrown horizontally from the same height, then the ratio of vertical distance covered by both objects at any instant t is

(a) 1 (b) 2

(c) 4 (d) 0.5

10. A ball is dropped from some height towards the ground. Which one of the following represents the correct motion of the ball?



11. If a particle executes uniform circular motion in the xy plane in clock wise direction, then the angular velocity is in

(a) +y direction

(b) +z direction

(c) -z direction

(d) -x direction

12. If a particle executes uniform circular motion, choose the correct statement (NEET 2016)

(a) The velocity and speed are constant.

(b) The acceleration and speed are constant.

(c) The velocity and acceleration are constant.

(d) The speed and magnitude of acceleration are constant.

13. If an object is thrown vertically up with the initial speed u from the ground, then the time taken by the object to return back to ground is

(a) $\frac{u^2}{2g}$ (b) $\frac{u^2}{g}$

(c) $\frac{u}{2g}$ (d) $\frac{2u}{g}$

www.Padasalai.Net

14. Two objects are projected at angles 30° and 60° respectively with respect to the horizontal direction. The range of two objects are denoted as R_{30^0} and R_{60^0}. Choose the correct relation from the following

(a) $R_{30^0} = R_{60^0}$

(b) $R_{30^0} = 4R_{60^0}$

(c) $R_{30^0} = \frac{R_{60^0}}{2}$

(d) $R_{30^0} = 2\ R_{60^0}$

15. An object is dropped in an unknown planet from height 50 m, it reaches the ground in 2 s. The acceleration due to gravity in this unknown planet is

(a) g = 20 m s^{-2} (b) g = 25 m s^{-2}

(c) g = 15 m s^{-2} (d) g = 30 m s^{-2}

UNIT 3

LAWS OF MOTION

I. Multiple Choice Questions

1. When a car takes a sudden left turn in the curved road, passengers are pushed towards the right due to

(a) inertia of direction

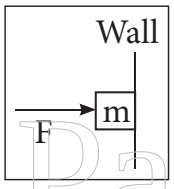
(b) inertia of motion

(c) inertia of rest

(d) absence of inertia

2. An object of mass m held against a vertical wall by applying horizontal force F as shown in the figure. The minimum value of the force F is

(IIT JEE 1994)



(a) Less than mg

(b) Equal to mg

(c) Greater than mg

(d) Cannot determine

3. A vehicle is moving along the positive x direction, if sudden brake is applied, then

(a) frictional force acting on the vehicle is along negative x direction

(b) frictional force acting on the vehicle is along positive x direction

(c) no frictional force acts on the vehicle

(d) frictional force acts in downward direction

4. A book is at rest on the table which exerts a normal force on the book. If this force is considered as reaction force, what is the action force according to Newton's third law?

(a) Gravitational force exerted by Earth on the book

(b) Gravitational force exerted by the book on Earth

(c) Normal force exerted by the book on the table

(d) None of the above

5. Two masses m_1 and m_2 are experiencing the same force where $m_1 < m_2$. The ratio of their acceleration $\frac{a_1}{a_2}$ is

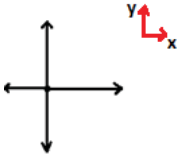
(a) 1

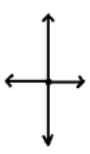
(b) less than 1

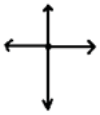
(c) greater than 1

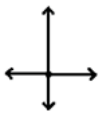
(d) all the three cases

6. Choose appropriate free body diagram for the particle experiencing net acceleration along negative y direction. (Each arrow mark represents the force acting on the system).

a) 

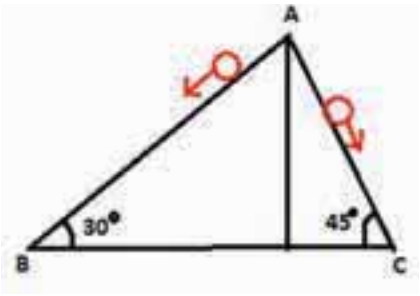
b) 

c) 

d) 

www.Padasalai.Net

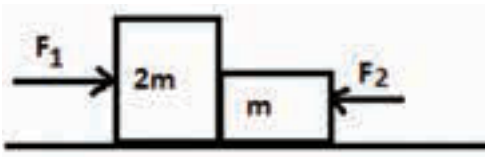
7. A particle of mass m sliding on the smooth double inclined plane (shown in figure) will experience



(a) greater acceleration along the path AB
(b) greater acceleration along the path AC
(c) same acceleration in both the paths
(d) no acceleration in both the paths.

8. Two blocks of masses m and 2m are placed on a smooth horizontal surface as shown. In the first case only a force F_1 is applied from the left. Later only a force F_2 is applied from the right. If the force acting at the interface of the two blocks in the two cases is same, then $F_1 : F_2$ is

(Physics Olympiad 2016)



(a) 1:1 (b) 1:2
(c) 2:1 (d) 1:3

9. Force acting on the particle moving with constant speed is
(a) always zero
(b) need not be zero
(c) always non zero
(d) cannot be concluded

10. An object of mass m begins to move on the plane inclined at an angle θ. The coefficient of static friction of inclined surface is μ_s. The maximum static friction experienced by the mass is
(a) mg
(b) $\mu_s$mg
(c) $\mu_s$mg sinθ
(d) μ_s mg cos θ

11. When the object is moving at constant velocity on the rough surface,
(a) net force on the object is zero
(b) no force acts on the object
(c) only external force acts on the object
(d) only kinetic friction acts on the object

12. When an object is at rest on the inclined rough surface,
(a) static and kinetic frictions acting on the object is zero
(b) static friction is zero but kinetic friction is not zero
(c) static friction is not zero and kinetic friction is zero
(d) static and kinetic frictions are not zero

13. The centrifugal force appears to exist
(a) only in inertial frames
(b) only in rotating frames
(c) in any accelerated frame
(d) both in inertial and non-inertial frames

www.Padasalai.Net

14. Choose the correct statement from the following

(a) Centrifugal and centripetal forces are action reaction pairs

(b) Centripetal forces is a natural force

(c) Centrifugal force arises from gravitational force

(d) Centripetal force acts towards the center and centrifugal force appears to act away from the center in a circular motion

15. If a person moving from pole to equator, the centrifugal force acting on him

(a) increases

(b) decreases

(c) remains the same

(d) increases and then decreases

www.Padasalai.Net

www.Padasalai.Net www.TrbTnps.com K SARAVANAN GHSS KORAKKAI

UNIT 4

WORK, ENERGY AND POWER

I. Multiple Choice Questions

1. A uniform force of $(2\hat{i}+\hat{j})$ N acts on a particle of mass 1 kg. The particle displaces from position $(3\hat{j}+\hat{k})$ m to $(5\hat{i}+3\hat{j})$ m. The work done by the force on the particle is

(AIPMT model 2013)

(a) 9 J (b) 6 J

(c) 10 J (d) 12 J

2. A ball of mass 1 kg and another of mass 2 kg are dropped from a tall building whose height is 80 m. After, a fall of 40 m each towards Earth, their respective kinetic energies will be in the ratio of

(AIPMT model 2004)

(a) $\sqrt{2}:1$ (b) $1:\sqrt{2}$

(c) $2:1$ (d) $1:2$

3. A body of mass 1 kg is thrown upwards with a velocity 20 m s^{-1}. It momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air friction?.

(Take $g=10ms^{-2}$) (AIPMT 2009)

(a) 20 J (b) 30 J

(c) 40 J (d) 10 J

4. An engine pumps water continuously through a hose. Water leaves the hose with a velocity v and m is the mass per unit length of the water of the jet. What is the rate at which kinetic energy is imparted to water ?.

(AIPMT 2009)

(a) $\frac{1}{2}mv^2$ (b) mv^3

(c) $\frac{3}{2}mv^2$ (d) $\frac{5}{2}mv^2$

5. A body of mass 4 m is lying in xy-plane at rest. It suddenly explodes into three pieces. Two pieces each of mass m move perpendicular to each other with equal speed *v*. The total kinetic energy generated due to explosion is

(AIPMT 2014)

(a) mv^2 (b) $\frac{3}{2}mv^2$

(c) $2mv^2$ (d) $4mv^2$

6. The potential energy of a system increases, if work is done

(a) by the system against a conservative force

(b) by the system against a non-conservative force

(c) upon the system by a conservative force

(d) upon the system by a non-conservative force

7. What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop?.

(a) $\sqrt{2gR}$ (b) $\sqrt{3gR}$

(c) $\sqrt{5gR}$ (d) $\sqrt{gR}$

8. The work done by the conservative force for a closed path is

(a) always negative

(b) zero

(c) always positive

(d) not defined

www.Padasalai.Net

http://www.trbtnpsc.com/2018/06/latest-plus-one-11th-study-materials-tamil-medium-english-medium-new-syllabus-based.html

9. If the linear momentum of the object is increased by 0.1%, then the kinetic energy is increased by

(a) 0.1 % (b) 0.2%

(c) 0.4% (d) 0.01%

10. If the potential energy of the particle is $\alpha - \frac{\beta}{2}x^2$, then force experienced by the particle is

(a) $F = \frac{\beta}{2}x^2$ (b) $F = \beta x$

(c) $F = -\beta x$ (d) $F = -\frac{\beta}{2}x^2$

11. A wind-powered generator converts wind energy into electric energy. Assume that the generator converts a fixed fraction of the wind energy intercepted by its blades into electrical energy. For wind speed v, the electrical power output will be proportional to

(a) v (b) v^2

(c) v^3 (d) v^4

12. Two equal masses m_1 and m_2 are moving along the same straight line with velocities $5\,ms^{-1}$ and $-9\,ms^{-1}$ respectively. If the collision is elastic, then calculate the velocities after the collision of m_1 and m_2, respectively

(a) $-4\,ms^{-1}$ and $10\ ms^{-1}$

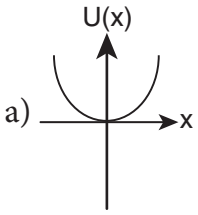
(b) $10ms^{-1}$ and $0\ ms^{-1}$

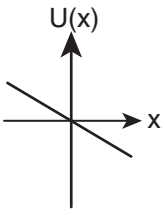
(c) $-9\,ms^{-1}$ and $5\ ms^{-1}$

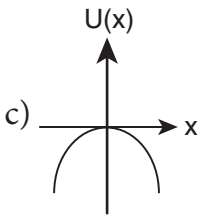
(d) $5\ ms^{-1}$ and $1\ ms^{-1}$

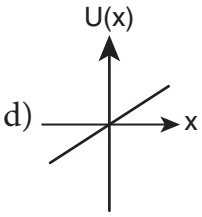
13. A particle is placed at the origin and a force $F = kx$ is acting on it (where k is a positive constant). If $U(0) = 0$, the graph of $U(x)$ versus x will be (where U is the potential energy function)

(IIT 2004)

a) 

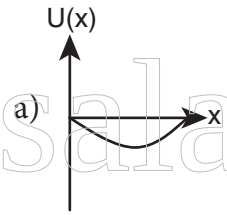
b) 

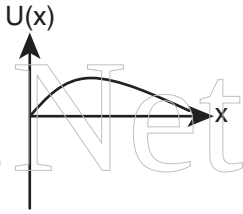
c) 

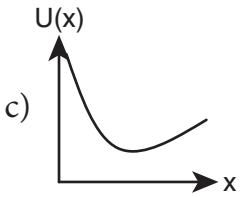
d) 

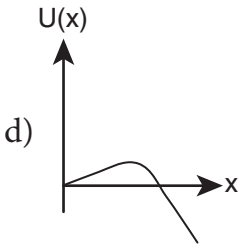
14. A particle which is constrained to move along x-axis, is subjected to a force in the same direction which varies with the distance x of the particle from the origin as $F(x) = -kx + ax^3$. Here, k and a are positive constants. For $x \geq 0$, the functional form of the potential energy $U(x)$ of the particle is

(IIT 2002)

a) 

b) 

c) 

d) 

15. A spring of force constant k is cut into two pieces such that one piece is double the length of the other. Then, the long piece will have a force constant of

(a) $\frac{2}{3}k$ (b) $\frac{3}{2}k$

(c) $3k$ (d) $6k$

www.Padasalai.Net

www.Padasalai.Net www.TrbTnps.com K SARAVANAN GHSS KORAKKAI

UNIT 5

MOTION OF SYSTEM OF PARTICLES AND RIGID BODIES

I. Multi Choice Question

1. The center of mass of a system of particles does not depend upon,

(a) position of particles

(b) relative distance between particles

(c) masses of particles

(d) force acting on particle

[AIPMT 1997, AIEEE 2004]

2. A couple produces,

(a) pure rotation

(b) pure translation

(c) rotation and translation

(d) no motion

[AIPMT 1997]

3. A particle is moving with a constant velocity along a line parallel to positive X-axis. The magnitude of its angular momentum with respect to the origin is,

(a) zero

(b) increasing with x

(c) decreasing with x

(d) remaining constant

[IIT 2002]

4. A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force 30 N?

(a) 0.25 rad s^{-2} (b) 25 rad s^{-2}

(c) 5 m s^{-2} (d) 25 m s^{-2}.

[NEET 2017]

5. A closed cylindrical container is partially filled with water. As the container rotates in a horizontal plane about a perpendicular bisector, its moment of inertia,

(a) increases (b) decreases

(c) remains constant

(d) depends on direction of rotation.

[IIT 1998]

6. A rigid body rotates with an angular momentum L. If its kinetic energy is halved, the angular momentum becomes,

(a) L (b) L/2

(c) **2L** (d) $L/\sqrt{2}$

[AFMC 1998, AIPMT 2015]

7. A particle undergoes uniform circular motion. The angular momentum of the particle remain conserved about,

(a) the center point of the circle.

(b) the point on the circumference of the circle.

(c) any point inside the circle.

(d) any point outside the circle.

[IIT 2003]

8. When a mass is rotating in a plane about a fixed point, its angular momentum is directed along,

(a) a line perpendicular to the plane of rotation

(b) the line making an angle of 45° to the plane of rotation

(c) the radius

(d) tangent to the path

[AIPMT 2012]

http://www.trbtnpsc.com/2018/06/latest-plus-one-11th-study-materials-tamil-medium-english-medium-new-syllabus-based.html

9. Two discs of same moment of inertia rotating about their regular axis passing through center and perpendicular to the plane of disc with angular velocities ω_1 and ω_2. They are brought in to contact face to face coinciding the axis of rotation. The expression for loss of energy during this process is,

(a) $\frac{1}{4}I(\omega_1-\omega_2)^2$ (b) $I(\omega_1-\omega_2)^2$

(c) $\frac{1}{8}I(\omega_1-\omega_2)^2$ (d) $\frac{1}{2}I(\omega_1-\omega_2)^2$

[NEET 2017]

10. A disc of moment of inertia I_a is rotating in a horizontal plane about its symmetry axis with a constant angular speed ω. Another discinitially at rest of moment of inertia I_b is dropped coaxially on to the rotating disc. Then, both the discs rotate with same constant angular speed. The loss of kinetic energy due to friction in this process is,

(a) $\frac{1}{2}\frac{I_b^{\,2}}{(I_a+I_b)}\omega^2$

(b) $\frac{I_b^{\,2}}{(I_a+I_b)}\omega^2$

(c) $\frac{(I_b-I_a)^2}{(I_a+I_b)}\omega^2$

(d) $\frac{1}{2}\frac{I_bI_b}{(I_a+I_b)}\omega^2$ [AIPMT 2001]

11. The ratio of the acceleration for a solid sphere (mass m and radius R) rolling down an incline of angle θ without slipping and slipping down the incline without rolling is,

(a) 5:7 (b)2:3 (c) 2:5 (d) 7:5

[AIPMT 2014]

12. From a disc of radius R a mass M, a circular hole of diameter R, whose rim passes through the center is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis passing through it

(a) $15MR^2/32$ (b) $13MR^2/32$

(c) $11MR^2/32$ (d) $9MR^2/32$

[NEET 2016]

13. The speed of a solid sphere after rolling down from rest without sliding on an inclined plane of vertical height h is,

(a) $\sqrt{\frac{4}{3}gh}$ (b) $\sqrt{\frac{10}{7}gh}$

(c) $\sqrt{2gh}$ (d) $\sqrt{\frac{1}{2}gh}$

14. The speed of the center of a wheel rolling on a horizontal surface is v_o. A point on the rim in level with the center will be moving at a speed of speed of,

(a) zero (b) v_o

(c) $\sqrt{2}\,v_o$ (d) $2v_o$

[PMT 1992, PMT 2003, IIT 2004]

15. A round object of mass M and radius R rolls down without slipping along an inclined plane. The fractional force,

(a) dissipates kinetic energy as heat.

(b) decreases the rotational motion.

(c) decreases the rotational and transnational motion

(d) converts transnational energy into rotational energy

[PMT 2005]

www.Padasalai.Net