Laws of Motion Important Questions With Answers

NEET Physics 2023

1. A block of mass M is being pulled along rough horizontal surface. The coefficient of friction between the block and the surface is μ. If another block of mass M/2 is placed on the block and it is again pulled on the surface, the coefficient of friction between the block and the surface will be:
   a) μ b) $3\mu/2$ c) 2μ d) $5\mu/2$

   Solution : -
   Coefficient of friction is independent of the normal reaction. Hence, it will remain same.

2. A flywheel of mass 50 kg and radius of gyration about its axis of rotation of 0.5 m is acted upon by a constant torque of 12.5 N-m. Its angular velocity at t = 5 see is:
   a) 2.5 rad/sec **b) 5 rad/sec** c) 7.5 rad/sec d) 10 rad/sec

   Solution : -
   $I = MK^2 = 50 \times (0.5)^2 kg - m^2$
   $\tau = 12.5N - m$
   $\alpha = \frac{\tau}{I} \frac{2.5}{50 \times \left(\frac{1}{2}\right)^2} = 1 rad/sec^2$
   $\omega = \omega_0 + \alpha\tau = 0 + 1 \times 5 = 5 rad/sec.$

3. A car of mass m moves in a horizontal circular path of radius r metre. At an instant, its speed is V m/s and is increasing at a rate of a m/sec^2. Then the acceleration of the car is:
   a) $\frac{V^2}{r}$ b) a **c)** $\sqrt{a^2 + \left(\frac{v^2}{r}\right)^2}$ **m** d) $\sqrt{a + \frac{v^2}{r}}$

   Solution : -
   Radial acceleration, $a_r = \frac{v^2}{r}$
   Tangential acceleration, at = a
   Resultant acceleration a' = $\sqrt{a_r^2 + a_t^2 + 2a_r a_t cos\theta}$
   But here θ = 90° ∴ cos θ = cos 90° = 0,
   and a' = $\sqrt{a_r^2 + a_t^2} = \sqrt{\left(\frac{v^2}{r}\right)^2 + a^2}$

4. Assertion: A rigid body not fixed in some way can have either pure translation or a combination of translation and rotation.
   Reason: In rotation about a fixed axis, every particle of the rigid body moves in a circle which lies in a plane perpendicular to the axis and has its centre on the axis
   a) If both assertion and reason are true and reason is the correct explanation of assertion
   b) If both assertion and reason are true but reason is not the correct explanation of assertion
   c) If assertion is true but reason is false d) If both assertion and reason are false

   Solution : -
   A rigid body fixed at one point or along a line can have only rotational motion. A rigid body not fixed in some way can have either pure translation or a combination of translation and rotation.

5. A force acts on a 3.0 g particle in such a way that the position of the particle as a function of time is given by: x = $3t - 4t^2 + t^3$
   Where x is in metres and 1 is in seconds. The work done during the first 4 s is:

a) 570 mJ b) 450 mJ c) 490 mJ **d) 530 mJ**

Solution : -

$x = 3t - 4t^2 + t^3$

$\frac{dx}{dt} = 3 - 8t + 3t^2$ and $a = \frac{d^2x}{dt^2} = -8 + 6t$

Now, $w = \int F dx = \int ma dx = \int ma \frac{dx}{dt} dt$

$= \int_0^4 \frac{3}{1000} \times (-8 + 6t)(3 - 8t + 3t^2) dt$

On integrating, we get; W = 530 mJ

6. The moment of inertia of a solid sphere of density p and radius R about its diameter is:

a) $\frac{105}{176} R^5 p$ b) $\frac{105}{176} R^2 p$ **c)** $\frac{176}{105} R^5 p$ d) $\frac{176}{105} R^2 p$

Solution : -

For solid sphere,

$I = \frac{2}{5} MR^2 = \frac{2}{5} \left(\frac{4}{3} \pi R^2 p\right) R^2$

$= \frac{8}{15} \times \frac{22}{7} R^2 p = \frac{176}{105} R^5 p.$

7. (A) The relative angular velocity between any two points of a rigid body is zero at any instant.
(R) There is no relative velocity between the points of a rigid body.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

8. (A) When a rigid body is rotating about a fixed axis, every particle of the rigid body have same angular velocity and angular acceleration.
(R) For every pair of particles in a rigid body, there is no velocity of separation or approach between the particles.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

9. (A) When a particle moves in a circle with a uniform speed, its velocity and acceleration both changes.
(R) The centripetal acceleration in circular motion is dependent on angular velocity of the body.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

Solution : -

Both assertion and reason are true but reason is not the correct explanation of assertion.

In uniform circular motion, the magnitude of velocity and acceleration remains same, but due to change in direction of motion, the direction of velocity and acceleration changes. Also the centripetal acceleration is given by $a = \omega^2 r$.

10. A particle of mass M is moving in a horizontal circle of radius R with uniform speed V. When it moves from one point to a diametrically opposite point, its:

a) kinetic energy changes by $\frac{MV^2}{4}$ b) momentum does not change **c) momentum changes by 2MV**
d) kinetic energy changes by MV^2

Solution : -

On diametrically opposite points, the velocities have same magnitude but opposite directions. Therefore, change in momentum in MV-(-MV)=2MV

11. (A) It will be much easier to accelerate a merry- go-round full of children if they stand close to its axis then if they all stand at the outer edge.
(R) For larger moment of inertia, the angular acceleration is small for given torque.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.

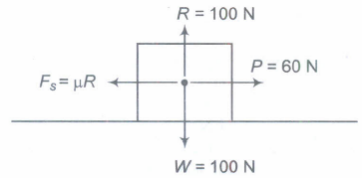
c) If assertion is true but reason is false d) If both assertion and reason are false
e) If assertion is false but reason is true

12. A body of weight 100 Newtons is placed on a rough horizontal plan. Determine the co-efficient of friction if a horizontal force of 60 Newtons just causes the body to slide over the horizontal plane.
a) 1.2 b) 0.1 c) 1.9 **d) 0.6**

Solution : -

Given:

Weight of body, W = 100N



Let μ=Co-efficient of friction.

From the given figure

P = Fs

$60N = \mu \times R$

or, $\mu = \frac{60N}{R} = \frac{60N}{10N}$

or, μ=0.6

13. (A) In order to stop a car in shortest distance on a horizontal road, one should apply the brakes hard enough to just preventing slipping.
(R) The coefficient of static friction is larger than the coefficient of kinetic friction.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

14. A constant torque acting on a uniform circular wheel changes its angular momentum from A_0 to $4A_0$ in 4 seconds. The magnitude of this torque is:
a) $3A_0/4$ b) A_0 c) $4A_0$ d) $12A_0$

15. A child is swinging a swing. Minimum and maximum heights of swing from the earth's surface are 0.75 m and 2 m respectively. The maximum velocity of this swing is:
a) 5 m/s b) 10 m/s c) 15 m/s d) 20 m/s

16. (A) The angular velocity of any point on a rigid body is same w.r.t. any other point on the rigid body.
(R) All points on a rigid body will rotate through same angle in same time.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

17. When a disc rotates with uniform angular velocity, which of the following is not true?
a) The sense of rotation remains same b) The orientation of the axis of rotation remains same
c) The speed of rotation is non-zero and remains same
d) The angular acceleration is non-zero and remains same

Solution : -

When a disc rotates with uniform angular velocity angular accekeration of the disc is zero.Hence , option (d) is not true.

18. Bullets of 0.03 kg mass each hit a plate at the rate of 200 bullets per second, with a velocity of 50 mlsec and reflect back with a velocity of 30 m s^{-l}. The average force acting on the plate (in Newton) is:
a) 120 b) 180 c) 300 **d) 480**

Solution : -

Average force = $\frac{change\ is\ momentum}{time\ taken}$

Force = $\frac{M(v_1 - v_2)}{1}$

Mass of I bullet = 0.03 kg

For 200 bullets = 0.03x200

= 6kg

time = I sec

Velocity of bullets, 11 = 50m s^{-1}

Velocity of bullets with which they reflect = -30m s^{-1}

$\therefore$ Force = $\frac{6[50-(-30)]}{1}$

= 480 N

19. A particle covers equal distances around a circular path in equal intervals of time. It has uniform non-zero rate of change of:

a) linear displacement **b) angular displacement** c) linear velocity d) angular velocity

Solution : -

Angular speed of the particle, i. e , rate of change of angular displacement of the particle remains constant.

20. (A) An object can possess acceleration even at a time when it has uniform speed.

(R) It is possible when the direction of motion keeps changing.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion is false but reason is true.

21. (A) If earth shrinks to half its present size, length of the day would become 6 hours.

(R) As the size of the earth changes, its moment of inertia changes.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion is false but reason is true.

Solution : -

Both assertion and reason are true and reason is the correct explanation of assertion.

According to principle of conservation of angular momentum, I ω = constant

$MK^2 \left(\frac{2\pi}{T}\right)$ = constant or $\frac{K^2}{T}$ constant

(where K is radius of gyration and ro = 2π / T.)

When K becomes V2, K^2 becomes (1 /4) th Therefore, T becomes

(1/4) th of initial value, i. e., $\frac{24}{4}$ = 6 hours.

22. A packet of weight W is dropped with the help of a parachute and on striking the ground comes to rest with a retardation equal to twice the acceleration due to gravity. What is the force exerted on the ground?

a) W b) 2W **c) 3W** d) 4W

Solution : -

Mass of Packet M = $\frac{W}{g}$

Now, F -W = M x a

Or, F - W = $\frac{W}{g}$ x 2g = 2W

$\therefore$ F = 3W

23. A ball is travelling with uniform translatory motion. This means that

a) it is at rest b) the path can be a straight line or circular and the ball travels with uniform speed

c) all parts of the ball have the same velocity (magnitude and direction) and the velocity is constant

d) the centre of the ball moves with constant velocity and the ball spins about its centre uniformly

Solution : -

In uniform translatory motion, all parts of the ball have the same velocity in magnitude and direction and this velocity is constant

24. A convey or belt is moving at a constant speed of 2m/s' A box is gently dropped on it. The coefficient of friction between them is m: 0.5. The distance that the box will move relative to belt before coming to rest on it taking g = 10 ms 2, is _____

a) 12m b) 0.6m c) zero **d) 0.4m**

Solution : -

Frictional force on the box f = mmg

Acceleration in the box

$a = \mu g = 5 \text{ ms}^{-2}$

$v^2 = u^2 + 2as$

$\Rightarrow\ 0 = 2^2 + 2 \times (5)s$

$\Rightarrow\ s = -\frac{2}{5} \text{ w.r.t. belt}$

$\Rightarrow \text{ Distance } = 0.4 \text{ m}$

25. (A) The centre of mass and centre of gravity of a body are two different positions in general.

(R) The centre of mass and centre of gravity of a body coincide if gravitational field is uniform.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion isfalse but reason is true.

26. A weightless thread can support tension upto 30 N. A stone of mass 0.5 kg is tied to it and is revolved in a circular path of radius 2m in a vertical plane. If g =10ms^{-2}, then the maximum angular velocity of the stone will be:

a) 5 rad/s b) $\sqrt{30}$ rad/s c) $\sqrt{60}$ rad/s d) 10 rad/s

Solution : -

$T_{max.} = m(r\omega^2 + g)$

$30 = 0.5(2 \times \omega^2 + 10)$

$2\ \omega^2 = 50$ or $\omega^2 = 5$ rad/sec

27. We can derive Newton's

a) second and third laws from the first law. b) first and second laws from the third law.

c) third and first laws from the second law d) all the three laws are independent of each other.

Solution : -

We can derive Newton's third and first laws from the second law

28. If the earth suddenly stops revolving and all its rotational KE is used up in raising its temperature and if s is taken to be the specific heat of the earth's material, the rise of temperature of the earth will be: (R = radius ofthe earth and (ω = its angular velocity)

a) $\frac{R^2\omega^2}{5Js}$ b) $\frac{R^2\omega^2}{5J}$ c) $\frac{R^2\omega}{5Js}$ d) $\frac{R^2\omega^2}{5s}$

Solution : -

$\frac{K_R}{J} = \frac{\frac{1}{2}I\omega^2}{J} = Ms\theta$

or $\frac{1}{2} \times \frac{2}{5}\frac{MR^2\omega^2}{J} = Ms\theta$

$\therefore \theta = \frac{R^2\omega^2}{5sJ}.$

29. (A) A man who falls from a height on a cement floor receive more injury than when he falls from the same height on a heap of sand.

(R) The impulse given by cement floor is more than the impulse given by a heap of sand.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion is false but reason is true.

30. An object kept on a smooth inclined plane of 1 in 1 can be kept stationary relative to the incline by giving a horizontal acceleration to the inclined plane given by:

a) g sin θ b) g cos θ **c) g tan** θ d) none of these

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31. The direction of motion of body with the horizontal at this instant is:
a) $\tan^{-1}$ (2) b) $\tan^{-1}$ (1/2) c) 45° d) 0°

32. A rope of length 10 m and linear density of 0.5 kg/m is lying lengthwise on a smooth horizontal floor. It is pulled by a force of 25 N. The tension in the rope at a point 8 m away from the point of application is:
a) 20 N b) 15 N c) 10 N **d) 5 N**

Solution : -
Mass of the rope = 10 x 0.5 = 5 kg
a = $\frac{25}{5}$ = 5 ms^{-2}
Mass of the rope upto 8 m = 8 x 0.5 = 4 kg
Force acting on it = 4 x 5 = 20 N
Remaining force = 25 - 20 = 5 N

33. A block of metal weighing 2 kg is resting on a frictionless plane. It is struck by a jet releasing water at a rate of 1 kg/s and at a speed of 5 mls. The initial acceleration of the block will be:
a) 2.5 m/s^2 b) 5 m/s2 c) 10m/s^2 d) 20m/s^2

Solution : -
The water jet striking the block at the rate of I kg/s at a speed of 5m1swill exert a force on the block
$F = v\frac{dm}{dt}$ = 5 x 1 = 5N
Under the action of this force of 5 N, the block of mass 2 kg will move with an acceleration given by:
$a = \frac{F}{m} = \frac{5}{2}$ = 2.5 ms^{-2}

34. (A) If polar ice melts, days will be shorter.
(R) Moment of inertia decreases and thus angular velocity increases.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

Solution : -
Assertion is true but reason is false.
If there were only one propeller in the helicopter, the helicopter itself, would have turned in opposite direction of the direction of propeller due to conservation of angular momentum. Thus, two propeller provides helicopter, a steady movement.

35. A wheel is subjected to uniform angular acceleration about its axis. Initially its angular velocity is zero. In the first 2 sec, it rotates through an angle θ_1; in the next 2 see it rotates through an additional angle θ_2. The ratio of $\frac{\theta_2}{\theta_1}$.
a) 1 b) 2 **c) 3** d) 5

Solution : -
$\theta = \omega 0t + \frac{1}{2} \propto t_2$
Here, $\omega 0 = 0$, $\theta_1 = \frac{1}{2} \propto (2)2 = 2\propto$
$\theta_2 = \frac{1}{2} \propto (4)^2 - \theta_1 = 8\propto - 2\propto = 6\propto$
$\therefore \frac{\theta_2}{\theta_1} = \frac{6\alpha}{2\alpha} = 3.$

36. A batsman hits back a ball of mass 0.15 kg straight in the direction of the bowler without changing its initial speed of 12 m S^{-1}. If the ball moves linearly, then the impulse imparted to the ball is
a) 1.8 N s b) 2.8 N s **c) 3.6 N s** d) 4.2 N s

Solution : -
Change in momentum = 0.15 x12 - (-0.15x12)
= 3.6 Ns
Impulse = 3.6 Ns in the direction from the batsman to the bowler.

37. A suitcase is gently dropped on a conveyor belt moving at 3 m/s. If the coefficient offriction between the belt and the suitcase is 0.5, find the displacement of the suitcase relative to conveyor belt before the slipping between the two is stopped: (g = 10m/s^2)
a) 2.7 m b) 1. 8 m **c) 0.9 m** d) 1.2 m

Solution : -

Acceleration of suitcase till the slipping continues is,

a = $\frac{f_{max}}{m}$

a = $\frac{\mu mg}{m}$ = μg = 0. 5 x 10

= 5 m/s^2

Slipping will continue till its velocity also becomes 3 rn/s.

$\therefore$ v = u +at

or 3 = 0 + 5t or t = 0.6 s

In This time, displacement of suitcase

$s_1 = \frac{1}{2}at^2 = \frac{1}{2}5 \times (0.6)^2 = 0.9m$

and displacement of the belt

S_2 = vt = 3 x 0.6 = 1.8

Displacement of suitcases with respect to the belt

= s_1 - s_2 = 0.9 m

38. A body of mass 2 kg and surface area 10 cm^2 begins to slide down on inclined plane when the angle of inclination is π/6. If the surface area of the same body is made 20 cm^2, keeping the mass unchanged, it will begin to slide down when the angle of inclination is:

a) π/2 **b) π/6** c) π/3 d) 2π/3

39. Suppose a rocket with an initial mass M_0 expels a mass $\triangle$m in the form of gases in time $\triangle$t, then the mass of the rocket after time tis:

a) M_0 b) $M_0 + \frac{\triangle m}{\triangle t}$ c) $M_0 - \frac{\triangle m}{\triangle t}$ **d)** $M_0 - \frac{\triangle m}{\triangle t}t$

Solution : -

There occurs a loss in mass at the rate of$\triangle$m/$\triangle$t, hence loss in mass in time $t = \frac{\triangle m}{\triangle t} \times t$

Mass of the rocket after time t = $M_0 - \frac{\triangle m}{\triangle t}$ x t

40. A drum of radius R and mass M, rolls down without slipping along an inclined plane of angle θ. The frictional force:

a) converts translational energy to rotational energy b) dissipates energy as heat

c) decreases the rotational motion d) decreases the rotational and translational motion

41. A hoop of radius 2 m weighs 100 kg. It rolls along a horizontal floor so that its centre of mass has a speed of 20 cm s^{-1}. How much work has to be done to stop it?

a) 2 J **b) 4 J** c) 6 J d) 8 J

Solution : -

Here, R = 2 m, M = 100 kg,

v = 20 cm s^{-1} = 20 X 10^{-2} m s^{-1}

Total kinetic energy of the hoop = K_T+ K_R

$= \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2 = \frac{1}{2}Mv^2 + \frac{1}{2}MR^2\omega^2$

$[\because \quad For \quad a \quad hoop, \quad I = MR^2]$

$= \frac{1}{2}mv^2 + \frac{1}{2}mv^2 \qquad [\because v = R\omega]$

mv^2

Work required to stop the hoop = Total kinetic energy of the hoop

Mv^2=(100kg)(20x10^{-2} ms^{-1})^2=4J

42. Two spheres of masses 2M and M are initially at rest at a distance R apart. Due to mutual force of attraction they approach each other. When they are at separation RI2 , the acceleration of the centre of mass of sphere would be:

a) Zero b) g m/s^2 c) 3g m/s^2 d) 12gm/s^2

43. A bird is sitting in a large closed cage which is placed on a spring balance. It records a weight placed on a spring balance. It records a weight of 25 N. he bird (mass = 0.5 kg) flies upward in the cage with an acceleration of 2m/s^2.The spring balance will now record a weight of:

a) 24 N **b) 25 N** c) 26 N d) 27 N

Solution : -

As the birds cage is closed there will be no external force and the force applied by the bird on the cage is internal, so there will be no change in recording of the reading of spring balance, so it will be 25N.

44. (A) The passengers sitting in a bus fall backward, whenthe bus suddenly starts moving.
(R) Every body has the inability to change by itself, its state of rest.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

45. Awire of mass mand length lis bent in the form ofa circular ring. The moment of inertia ofthe ring about its axis is:
a) ml^2 **b)** $\frac{ml^2}{4\pi^2}$ c) $\frac{ml^2}{2\pi^2}$ d) $\frac{ml^2}{8\pi^2}$

Solution : -
When a wire is bent in the form of a circular ring, then radius ofthe wire,
$r = \frac{1}{2\pi}$
∴ Monment of inertia of the ring about its axis,
$I = Mr^2 = m\left(\frac{1}{2\pi}\right)^2 \frac{Mr^2}{4\pi^2}.$

46. A uniform metal chain is placed on a rough table such that one end of it hangs down over the edge of the table. When one-third of its length hangs over the edge, the chain starts sliding. Then, the coefficient of static friction is:
a) $\frac{3}{4}$ b) $\frac{1}{4}$ c) $\frac{1}{4}$ **d)** $\frac{1}{2}$

47. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m. If a force F is applied at one end of the rope, the force which the rope exerts on the block is:
a) F/(M + m) b) F **c) FM/(m + M)** d) zero

Solution : -
Suppose the force on the block be P and acceleration of the system be a. Then $a = \frac{F}{(M+m)}$ and P =Ma = $a = \frac{MF}{(M+m)}$

48. Which one of the following statements is not true?
a) The same force for the same time causes the same change in momentum for different bodies.
b)
The rate of change of momentum of a body is directly proportional to the applied force and takes place in the direction in which the force acts.
c)
A greater opposing force is needed to stop a heavy body than a light body in the same time, if they are moving with the same speed.
d)
The greater the change in the momentum in a given time, the lesser is the force that needs to be applied.

Solution : -
The greater the change in the momentum in a given time, the greater is the force that needs to be applied.

49. A simple pendulum is suspended from the ceiling of a stationary elevator and its period of oscillation is T. The elevator is then set into motion and the new time period is found to be longer. Then, the elevator is:
a) accelerated upward **b) accelerated downward** c) moving upward with uniform speed
d) moving downward with uniform speed

50. A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic fliction between the block and the table is m_k. When the block A is sliding on the table, the tension in the string is
a) $\frac{(m_2-\mu k m_1)g}{(m_1+m_2)}$ **b)** $\frac{m_1 m_2(1+\mu_k)g}{(m_1+m_2)}$ c) $\frac{m_1 m_2(1-\mu_k)g}{(m_1+m_2)}$ d) $\frac{(m_2+\mu_k m_1)g}{(m_1+m_2)}$

Solution : -

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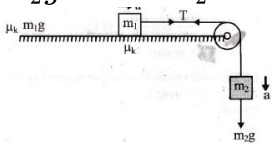
$We\ have,$

$m_1 a = T - \mu_k m_1 g$

$m_2 g - T = m_2 a$



$\Rightarrow m_1 a + \mu_k m_1 g = T$

$\text{and } m_2 g - m_2 a = T$

$\Rightarrow \ (m_1 + m_2)\, a = m_2 g - \mu_k m_1 g$

$\Rightarrow \ a = \frac{m_2 g - \mu_k m_1 g}{m_1 + m_2}$

$\therefore \ m_2 g - T = (m_2) \left(\frac{m_2 g - \mu_k m_1 g}{m_1 + m_2} \right)$

Solving we get tension in the string

$T = \frac{m_1 m_2 (1 + \mu_k) g}{m_1 + m_2}\ \text{s}$

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