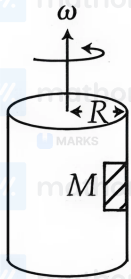


Q1. JEE Main 2026 (21 January Shift 2)

A large drum having radius R is spinning around its axis with angular velocity ω , as shown in figure. The minimum value of ω so that a body of mass M remains stuck to the inner wall of the drum, taking the coefficient of friction between the drum surface and mass M as μ , is :



(1) $\sqrt{\frac{\mu g}{R}}$

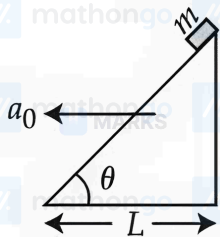
(2) $\sqrt{\frac{g}{2\mu R}}$

(3) $\sqrt{\frac{2g}{\mu R}}$

(4) $\sqrt{\frac{g}{\mu R}}$

Q2. JEE Main 2026 (28 January Shift 2)

A small block of mass m slides down from the top of a frictionless inclined surface, while the inclined plane is moving towards left with constant acceleration a_0 . The angle between the inclined plane and ground is θ and its base length is L . Assuming that initially the small block is at the top of the inclined plane, the time it takes to reach the lowest point of the inclined plane is _____.



(1) $\sqrt{\frac{2L}{g \sin \theta - a_0 \cos \theta}}$

(2) $\sqrt{\frac{4L}{g \cos^2 \theta - a_0 \sin \theta \cos \theta}}$

(3) $\sqrt{\frac{2L}{g \sin 2\theta - a_0(1 + \cos 2\theta)}}$

(4) $\sqrt{\frac{4L}{g \sin 2\theta - a_0(1 + \cos 2\theta)}}$

Q3. JEE Main 2026 (24 January Shift 2)

A flexible chain of mass m hangs between two fixed points at the same level. The inclination of the chain with the horizontal at the two points of support is 30° . Considering the equilibrium of each half of the chain, the tension of the chain at the lowest point is _____.

(1) $\frac{\sqrt{3}}{2}mg$

(2) mg

(3) $\frac{1}{2}mg$

(4) $\sqrt{3}mg$

Q4. JEE Main 2026 (23 January Shift 2)

A block is sliding down on an inclined plane of slope θ and at an instant $t = 0$ this block is given an upward momentum so that it starts moving up on the inclined surface with velocity u . The distance (S) travelled by the block before its velocity become zero, is ____.

(g = gravitational acceleration)

- (1) $\frac{2u^2}{\cos \theta}$ (2) $\frac{u^2}{2g \sin \theta}$ (3) $\frac{u^2}{2g \cos \theta}$ (4) $\frac{u^2}{\sqrt{2}g \cos \theta}$

Q5. JEE Main 2026 (21 January Shift 1)

A 4 kg mass moves under the influence of a force $\vec{F} = (4t^3\hat{i} - 3t\hat{j})$ N where t is the time in second. If mass starts from origin at $t = 0$, the velocity and position after $t = 2$ s will be:

- (1) $\vec{v} = 4\hat{i} - \frac{3}{2}\hat{j}$ $\vec{r} = \frac{6}{5}\hat{i} - \hat{j}$
 (2) $\vec{v} = 3\hat{i} + \frac{3}{2}\hat{j}$ $\vec{r} = \frac{6}{5}\hat{i} + \hat{j}$
 (3) $\vec{v} = 4\hat{i} - \frac{3}{2}\hat{j}$ $\vec{r} = \frac{8}{5}\hat{i} - \hat{j}$
 (4) $\vec{v} = 4\hat{i} + \frac{5}{2}\hat{j}$ $\vec{r} = \frac{8}{5}\hat{i} + 2\hat{j}$

Q6. JEE Main 2026 (28 January Shift 1)

A particle of mass m falls from rest through a resistive medium having resistive force, $F = -kv$, where v is the velocity of the particle and k is a constant. Which of the following graphs represents velocity (v) versus time (t)?

**Q7. JEE Main 2026 (28 January Shift 1)**

A block of mass 5 kg is moving on an inclined plane which makes an angle of 30° with the horizontal. Friction coefficient between the block and inclined plane surface is $\frac{\sqrt{3}}{2}$. The force to be applied on the block so that the block will move down without acceleration is ____ N.

($g = 10 \text{ m/s}^2$).

- (1) 25 (2) 7.5 (3) 12.5 (4) 15

Q8. JEE Main 2026 (24 January Shift 1)

A spring of force constant 15 N/m is cut into two pieces. If the ratio of their length is $1 : 3$, then the force constant of smaller piece is _____ N/m .

(1) 60

(2) 15

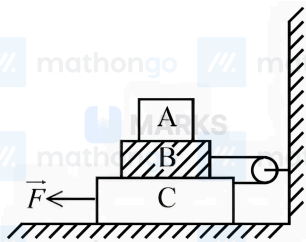
(3) 20

(4) 45

Q9. JEE Main 2026 (24 January Shift 1)

In the given figure the blocks A , B and C weigh 4 kg , 6 kg and 8 kg respectively. The co-efficient of sliding friction between any two surfaces is 0.5 . The force $\vec{F}$ required to slide the block C with constant speed is _____ N .

(Use $g = 10 \text{ m/s}^2$)



ANSWERS AND SOLUTIONS

1. (4) 2. (4) 3. (1) 4. (2) 5. (3) 6. (1) 7. (3) 8. (1)
9. 210

1. (4) Consider the mass M in the frame of the rotating drum. The forces acting on the mass are:

1. Weight Mg acting vertically downwards.

2. Normal reaction N from the wall acting towards the center, which provides the centripetal force: $N = M\omega^2 R$.

3. Frictional force f acting vertically upwards to balance the weight.

For the mass to remain stuck to the wall, the frictional force must balance the weight: $f = Mg$.

The maximum available static friction is $f_{max} = \mu N = \mu M\omega^2 R$.

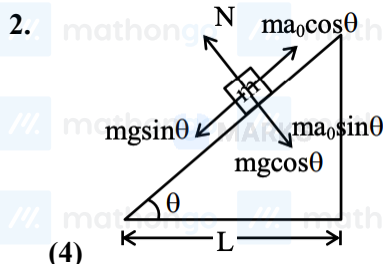
To prevent slipping, we must have $f_{max} \geq Mg$.

$$\mu M\omega^2 R \geq Mg$$

$$\omega^2 \geq \frac{g}{\mu R}$$

$$\omega \geq \sqrt{\frac{g}{\mu R}}$$

The minimum value of ω is $\sqrt{\frac{g}{\mu R}}$.



$$mg \sin \theta - ma_0 \cos \theta = ma$$

$$a = g \sin \theta - a_0 \cos \theta$$

Now using,

$$S = ut + \frac{1}{2} a_{down} t^2$$

$$\frac{L}{\cos \theta} = \frac{1}{2} (g \sin \theta - a_0 \cos \theta) t^2$$

$$t = \sqrt{\frac{2L}{g \sin \theta \cos \theta - a_0 \cos^2 \theta}}$$

$$t = \sqrt{\frac{4L}{g \sin 2\theta - a_0 (1 + \cos 2\theta)}}$$

3. (1) A chain of mass m hangs between two fixed points at the same level with inclination 30° at support points.

Consider equilibrium of one half of the chain (mass $m/2$):

$$\text{Horizontal equilibrium: } T_0 = T_1 \cos(30^\circ) = T_1 \cdot \frac{\sqrt{3}}{2}$$

$$\text{Vertical equilibrium: } T_1 \sin(30^\circ) = \frac{m}{2} g$$

From vertical equation: $T_1 \cdot \frac{1}{2} = \frac{mg}{2}$, giving $T_1 = mg$

Substituting into horizontal equation: $T_0 = mg \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}mg$

4. (2) $a = -g \sin \theta$

$$V^2 = U^2 + 2as$$

$$0 = u^2 - 2g \sin \theta \cdot s$$

$$s = \frac{u^2}{2g \sin \theta}$$

5. (3) Given $\vec{F} = (4t^3\hat{i} - 3t\hat{j})$ N, $m = 4$ kg

$$\vec{a} = \frac{\vec{F}}{m} = t^3\hat{i} - \frac{3t}{4}\hat{j}$$

Integrating with $\vec{v}(0) = 0$:

$$\vec{v} = \frac{t^4}{4}\hat{i} - \frac{3t^2}{8}\hat{j}$$

$$\text{At } t = 2: \vec{v} = \frac{16}{4}\hat{i} - \frac{12}{8}\hat{j} = 4\hat{i} - \frac{3}{2}\hat{j}$$

Integrating with $\vec{r}(0) = 0$:

$$\vec{r} = \frac{t^5}{20}\hat{i} - \frac{t^3}{8}\hat{j}$$

$$\text{At } t = 2: \vec{r} = \frac{32}{20}\hat{i} - \frac{8}{8}\hat{j} = \frac{8}{5}\hat{i} - \hat{j}$$

6. (1) The particle experiences downward gravitational force (mg) and upward resistive force ($-kv$).

The equation of motion is $m \frac{dv}{dt} = mg - kv$.

Initially at $t = 0$, $v = 0$ gives maximum acceleration $a_0 = g$.

As velocity increases, the resistive force increases, reducing the net acceleration.

Eventually the particle reaches terminal velocity $v_t = \frac{mg}{k}$ when acceleration becomes zero.

The velocity-time graph shows an increasing curve starting from origin with decreasing slope, asymptotically approaching the terminal velocity.

This behavior matches option (1), which displays a curve starting at (0,0) with steep initial slope that gradually flattens.

7. (3) For motion without acceleration, net force = 0.

Component of weight along incline: $mg \sin(30^\circ) = 5 \times 10 \times 0.5 = 25$ N (down).

Normal force: $N = mg \cos(30^\circ) = 50 \times \frac{\sqrt{3}}{2} = 25\sqrt{3}$ N.

Friction force opposing downward motion:

$$f = \mu N = \frac{\sqrt{3}}{2} \times 25\sqrt{3} = 37.5 \text{ N (up)}.$$

For equilibrium along the incline, applying force F down the incline:

$$mg \sin \theta + F = f, \text{ so } 25 + F = 37.5, \text{ giving } F = 12.5 \text{ N}.$$

8. (1) Spring force constant is inversely proportional to length: $k \propto \frac{1}{L}$

So $kL = \text{constant}$ for a given spring material and structure.

Original spring: $k = 15$ N/m, length = L .

Smaller piece has length $\frac{L}{4}$ (since length ratio is 1:3, smaller is $\frac{1}{4}$ of total).

For smaller piece: $k_1 \times \frac{L}{4} = 15 \times L$

$$k_1 = 15 \times 4 = 60 \text{ N/m}$$

9. (210) For the 8 kg block (C) to move with constant velocity, $F_{net} = 0$.

Friction forces acting:

- Between C and ground: $f = \mu(m_A + m_B + m_C)g = 0.5 \times (4 + 6 + 8) \times 10 = 90 \text{ N}$

- Between C and B: $f = \mu(m_A + m_B)g = 0.5 \times (4 + 6) \times 10 = 50 \text{ N}$

For the 6 kg block (B):

$$T = f_{B \text{ on ground}} + f_{A \text{ on B}}$$

$$T = \mu(m_A + m_B)g \cdot \frac{m_B}{m_A + m_B} + \mu \cdot m_A \cdot g$$

$$T = 20 + 50 = 70 \text{ N}$$

For the 8 kg block (C):

$$F = 90 + T + 50 = 90 + 70 + 50 = 210 \text{ N}$$