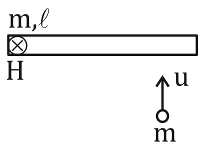
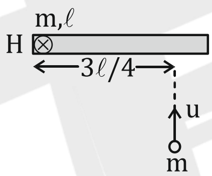
DPP 04

1. A uniform rod of mass m and length ℓ can rotate freely on a smooth horizontal plane about a vertical axis hinged at point H. A point mass having same mass m coming with an initial speed u perpendicular to the rod, strikes the rod in-elastically at its free end. The angular velocity of the rod just after collision is $\frac{ku}{(k+1)\ell}$. Then k ......

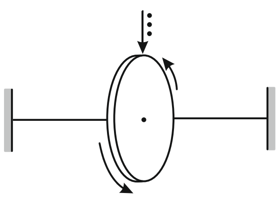


2. A uniform rod of mass m and length ℓ can rotate freely on a smooth horizontal plane about a vertical axis hinged at point H. A point mass having same mass m coming with an initial speed u perpendicular to the rod, strikes the rod and sticks to it at a distance of $3\ell/4$ from hinge point. The angular velocity of the rod just after collision is $\frac{ku}{(k+7)\ell}$. Then k .....



3. A uniform circular disc of mass m and radius a is rotating with constant angular velocity ω in a horizontal plane about a vertical axis through its centre A. A particle P of mass 2m is placed gently on the disc at a point distant $\frac{a}{2}$ from A. If the particle does not slip on the disc, and the new angular velocity of the rotating system is $\frac{\omega}{\beta}$. Then β ......

4. A disc of mass m_0 rotates freely about a fixed horizontal axis through its centre. A thin cotton pad is fixed to its rim, which can absorb water. The mass of water dripping onto the pad is μ per second. The time after which the angular velocity of the disc gets reduced to half of its initial value is

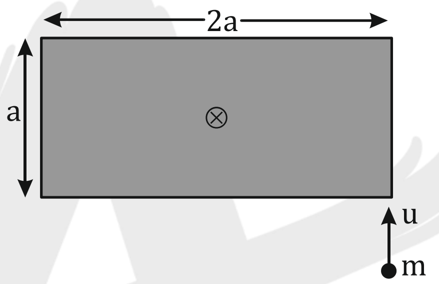


(A) $\frac{2m_0}{\mu}$ (B) $\frac{m_0}{2\mu}$ (C) $\frac{m_0}{\mu}$ (D) $\frac{3m_0}{\mu}$

5. A thin circular ring of mass M is rotating about its axis with a constant angular velocity ω. The two objects, each of mass m, are attached gently to the opposite ends of a diameter of the ring. The ring now rotates with an angular velocity

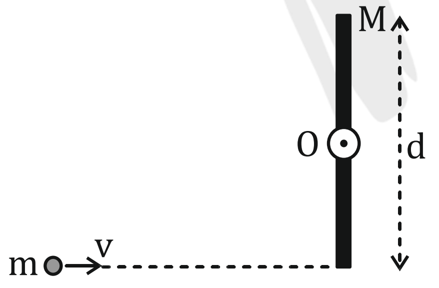
(A) $\frac{\omega M}{M+m}$ (B) $\frac{\omega(M-2m)}{M+2m}$ (C) $\frac{\omega M}{M+2m}$ (D) $\frac{\omega(M+2m)}{M}$

6. A uniform rectangular plate of mass m which is free to rotate about the smooth vertical hinge passing through the centre and perpendicular to the plate, is lying on a smooth horizontal surface. A particle of mass m moving with speed ' u ' collides with the plate and sticks to it as shown in figure. The angular velocity of the plate after collision will be :



(A) $\frac{12}{5}\frac{u}{a}$ (B) $\frac{12}{19}\frac{u}{a}$ (C) $\frac{3}{2}\frac{u}{a}$ (D) $\frac{3}{5}\frac{u}{a}$

7. A particle of mass m is moving horizontally at speed v perpendicular to a unitorm rod of length d and mass M = 6m. The rod is hinged at centre O and can freely rotate in horizontal plane about a fixed vertical axis passing through its centre O. The hinge is frictionless. The particle strikes by sticks to the end of the rod. The angular speed of the system just after the collision :



(A) 2v/3d (B) 3v/2d (C) v/3d (D) 2v/d

Paragraph Q. No. 8 to 9

A projectile is thrown from a point O on the ground at an angle 45° from the vertical and with a speed $5\sqrt{2}$ m s^{-1}. The projectile at the highest point of its trajectory splits into two equal parts. One part falls vertically down to the ground, 0.5 s after the splitting. The other part, t seconds after the splitting, falls to the ground at a distance x meters from the point O. The acceleration due to gravity $g = 10$ m s^{-2}.

8. The value of t .

(A) 0.5 (B) 1 (C) 1.5 (D) 2

9. The value of x.

(A) 7.5 (B) 15 (C) 20 (D) 30

ANSWER KEY

1.	3	**2.**	36	**3.**	2	**4.**	(B)	**5.**	(C)	**6.**	(D)	**7.**	(A)
8.	(A)	**9.**	(A)										