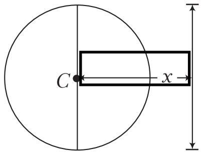
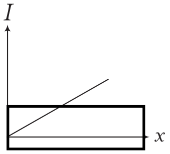
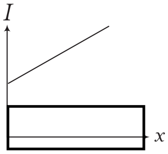
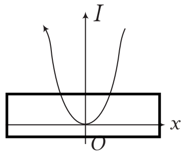
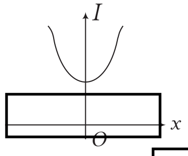
01. Figure represents the moment of inertia of the solid sphere about an axis parallel to the diameter of the solid sphere and at a distance x from it. Which one of the following represents the variations of I with x?



(a) 

(b) 

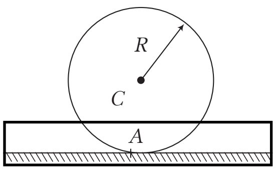
(c) 

(d) 

02. Two uniform, thin identical rods each of mass M and length l are joined together to form a cross. What will be the moment of inertia of the cross about an axis passing through the point at which the two rods are joined and perpendicular to the plane of the cross?

(a) $\frac{Ml^2}{12}$ (b) $\frac{Ml^2}{6}$ (c) $\frac{Ml^2}{4}$ (d) $\frac{Ml^2}{3}$

03. A disc of radius R rolls on a rough horizontal surface. The distance covered by the point A in one revolution is



(a) $2\pi R$ (b) $2R$ (c) $8R$ (d) πR

04. When a body is projected at an angle with the horizontal in a uniform gravitational field of the earth, the angular momentum of the body about the point of projection, as it proceeds along its path

(a) remains constant
(b) increases
(c) decreases
(d) initially decreases and after its highest point increases

05. A particle of mass $m = 5$ units is moving with a uniform speed $v = 3\sqrt{2}$ units in the XY-plane along the line $y = x + 4$. The magnitude of the angular momentum about origin is

(a) zero (b) 60 units (c) 7.5 units (d) $40\sqrt{2}$ units

06. A sphere rolls without slipping on a rough horizontal surface with centre of mass speed v_0. If mass of the sphere is M and its radius is R, then what is the angular momentum of the sphere about the point of contact?

(a) $\frac{5}{2} Mv_0R$ (b) $\frac{7}{5} Mv_0R$ (c) $\frac{3}{5} Mv_0R$ (d) $\frac{1}{2} Mv_0R$

07. The ratio of the radii of gyration of a circular disc and a circular ring of the same radii about a tangential axis perpendicular to plane of disc or ring is

(a) $1 : 2$ (b) $\sqrt{5} : \sqrt{6}$ (c) $2 : 3$ (d) $\sqrt{3} : 2$

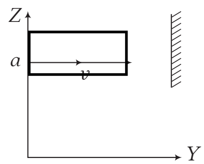
08. The ratio of the radii of gyration of a circular disc and a circular ring of the same radius about a tangential axis in the plane is

(a) $\sqrt{3} : \sqrt{4}$ (b) $\sqrt{5} : \sqrt{6}$
(c) $\sqrt{6} : \sqrt{5}$ (d) $\sqrt{4} : \sqrt{3}$

09. A particle of mass m is projected with a velocity v making an angle of 45° with the horizontal. The magnitude of angular momentum of projectile about the point of projection when the particle is at its maximum height h is

(a) zero (b) $\frac{mvh}{\sqrt{2}}$ (c) mvh (d) $\sqrt{2}\, mvh$

10. A particle of mass m is moving in YZ-plane with a uniform velocity v with its trajectory running parallel to + ve Y-axis and intersecting Z-axis at $z = a$ as shown in figure. The change in its angular momentum about the origin as it bounces elastically from a wall at y = constant is



[NCERT Exemplar]

(a) $mva\,\hat{\mathbf{e}}_x$ (b) $2\,mva\,\hat{\mathbf{e}}_x$ (c) $ymv\,\hat{\mathbf{e}}_x$ (d) $2\,ymv\,\hat{\mathbf{e}}_x$

11. A ring is kept on a rough inclined surface. But the coefficient of friction is less than the minimum value required for pure rolling. At any instant of time, let K_T and K_R be the translational and rotational kinetic energies of the ring respectively, then

(a) $K_R = K_T$ (b) $K_R > K_T$ (c) $K_T > K_R$ (d) $K_R = 0$

12. A ring and a disc of different masses are rotating with the same kinetic energy. If we apply a retarding torque τ on the ring, it stops after making n revolutions. After how many revolutions will the disc stop, if the retarding torque on it is also τ?

(a) $\frac{n}{2}$ (b) n
(c) $2n$ (d) Data insufficient

13. O is the centre of an equilateral triangle ABC. F_1, F_2 and F_3 are three forces acting along the sides AB, BC and AC respectively as shown in figure.