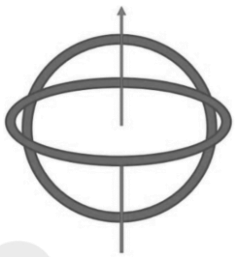
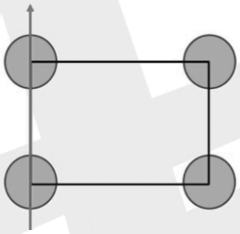
DPP - 1

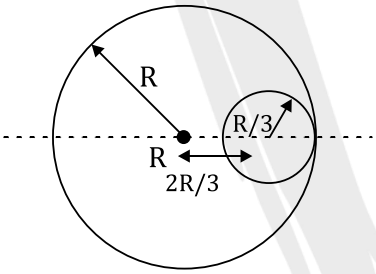
1. Two rings having the same radius and mass are placed such that their centres are at a common point and their planes are perpendicular to each other. the moment of inertia of the system about an axis passing through the centre and perpendicular to the plane of one of the rings. (M = mass of each ring and R = radius). Is $\frac{p}{q}MR^2$. then value of p + q is



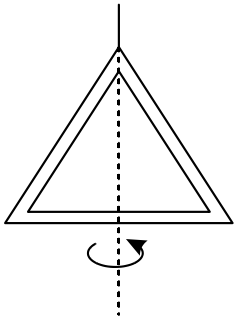
2. Each solid sphere have mass m and radius a and side of square massless frame is b.The MOI of the system about the given axis is $\frac{\alpha}{\beta}ma^2+\gamma mb^2$. find the value of $\frac{\alpha+\gamma}{\beta}$



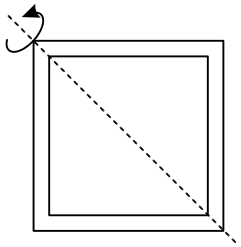
3. A disc of certain radius is cut from a disc of mass 9M and radius R. Its moment of inertia about an axis passing through its centre C and perpendicular to its plane is pMR^2. Calculate p.



4. Three rods each of mass m and length b form an equilateral triangle and rotate about the median of the triangle. Its moment of inertia is $\frac{amb^2}{16}$. Find a.



5. Four rods each of mass m form a square having length of diagonal b, rotates about its diagonal. Its moment of inertia is $\frac{pmb^2}{18}$. Find p.



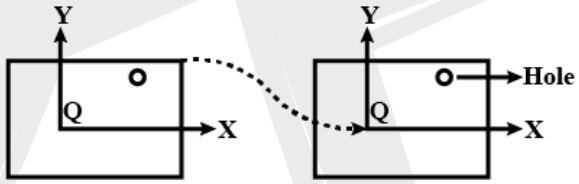
6. A solid aluminum sphere of radius R has moment of inertia I about an axis through its center. What will the moment of inertia about a central axis of a solid aluminum sphere of radius 2R ?

(A) 4I (B) 8I (C) 16I (D) 32I

7. A uniform rod of mass m and length ℓ_0 is rotating with a constant angular speed ω about a vertical axis passing through its point of suspension. The moment of inertia of the rod about the axis of rotation if it makes an angle θ to the vertical (axis of rotation) is

(A) $\frac{m\ell_0^2\sin^2\theta}{12}$ (B) $\frac{m\ell_0^2\sin^2\theta}{6}$ (C) $\frac{2m\ell_0^2\sin^2\theta}{3}$ (D) $\frac{m\ell_0^2\sin^2\theta}{3}$

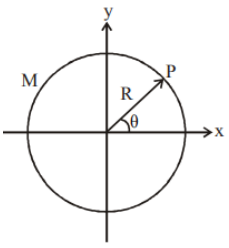
8. A uniform square plate has a small piece Q of an irregular shape removed and glued to the centre of the plate leaving a hole behind in the figure. The moment of inertia about the z-axis is then



(A) increased (B) decreased

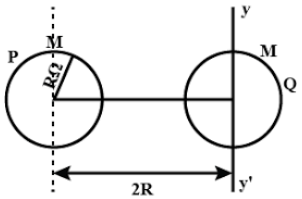
(C) the same (D) changed in unpredicted manner

9. A ring of mass M and radius R lies in x – y plane with its centre at origin as shown. The mass distribution of ring is nonuniform such that at any point P on the ring, the mass per unit length is given by $\lambda = \lambda_0 \cos^2\theta$ (where λ_0 is a positive constant). Then the moment of inertia of the ring about z-axis is:



(A) MR^2 (B) $\frac{1}{2}MR^2$ (C) $\frac{1}{2}\frac{M}{\lambda_0}R$ (D) $\frac{1}{\pi}\frac{M}{\lambda_0}R$

10. Two spheres, each of mass M and radius R/2, are connected with a massless rod of length 2R as shown in the figure. What will be the moment of inertia of the system about an axis passing through the centre of one of the spheres and perpendicular to the rod?

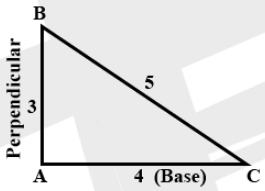


(A) $\frac{21}{5}MR^2$ (B) $\frac{2}{5}MR^2$ (C) $\frac{5}{2}MR^2$ (D) $\frac{5}{21}MR^2$

11. A rigid body can be hinged about any point on the x-axis, such that the hinge is at x. The moment of inertia is given by $I = x^2 - 2x + 99$. The x-coordinate of centre of mass is

(A) $x = 2$ (B) $x = 0$ (C) $x = 1$ (D) $x = 3$

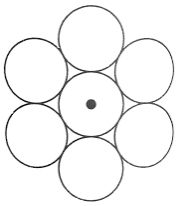
12. Moment of inertia of uniform triangular plate about axis passing through sides AB, AC and BC are I_P, I_B and I_H respectively and about an axis perpendicular to the plane and passing through point C is I_C. Then:



(A) $I_C > I_P > I_B > I_H$ (B) $I_H > I_B > I_C > I_P$

(C) $I_P > I_H > I_B > I_C$ (D) none of these

13. Seven identical discs are arranged in a hexagonal, planar pattern so as to touch each neighbor, as shown in the figure. Each disc has mass m and radius r. What is the moment of inertia of the system of seven disks about an axis passing through the centre of central disk and normal to plane of all disks?



(A) $\frac{7}{2}mr^2$ (B) $\frac{13}{2}mr^2$ (C) $\frac{29}{2}mr^2$ (D) $\frac{55}{2}mr^2$

ANSWER KEY

1.	5	**2.**	2	**3.**	4	**4.**	4	**5.**	6	**6.**	(D)	**7.**	(D)
8.	(B)	**9.**	(A)	**10.**	(A)	**11.**	(C)	**12.**	(A)	**13.**	(D)		