

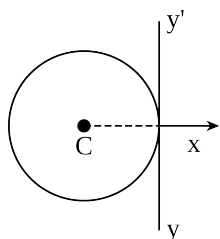
NEET SYSTEM OF PARTICLES AND ROTATIONAL MOTION — MOMENT OF INERTIA AND RADIUS OF GYRATION — PYQS

Max. Marks: 68

Questions: 17

Section A (MCQ) — 17 questions

- Q.1** A thin wire of length 'L' and linear mass density 'm' is bent into a circular ring (in x-y plane) with centre 'C' as shown in figure. The moment of inertia of the ring about an axis yy' will be: [NEET (UG) 2026]

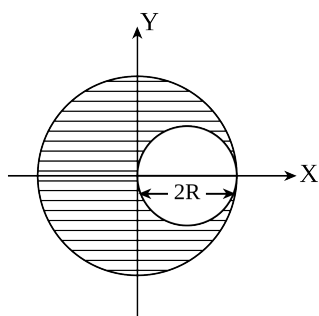


- (1) $\frac{3mL^3}{8\pi}$ (2) $\frac{3mL^2}{8\pi^2}$ (3) $\frac{3mL^3}{8\pi^2}$ (4) $\frac{3mL^2}{8\pi}$

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- Q.2** A sphere of radius R is cut from a larger solid sphere of radius 2R as shown in the figure. The ratio of the moment of inertia of the smaller sphere to that of the rest part of the sphere about the Y-axis is: [NEET (UG) 2025]



- (1) $\frac{7}{57}$ (2) $\frac{7}{64}$ (3) $\frac{7}{8}$ (4) $\frac{7}{40}$

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- Q.3** The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is 2400 g cm^2 . The length of the 400 g rod is nearly: [NEET (UG) 2024]

- (1) 8.5 cm (2) 17.5 cm (3) 20.7 cm (4) 72.0 cm

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- Q.4** The ratio of radius of gyration of a solid sphere of mass M and radius R about its own axis to the radius of gyration of the thin hollow sphere of same mass and radius about its axis is :-

[NEET (UG) 2023]

- (1) 5:3 (2) 2:5
(3) $\sqrt{5} : \sqrt{3}$ (4) $\sqrt{3} : \sqrt{5}$

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- Q.5** The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is [NEET (UG) 2022]

- (1) 2:1 (2) $\sqrt{2} : 1$ (3) 4:1 (4) $1 : \sqrt{2}$

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- Q.6** From a circular ring of mass 'M' and radius 'R' an arc corresponding to a 90° sector is removed. The moment of inertia of the remaining part of the ring about an axis passing through the center of the ring and perpendicular to the plane of the ring is 'K' times ' MR^2 '. Then the value of 'K' is :

[NEET (UG) 2021]

- (1) $\frac{1}{8}$ (2) $\frac{3}{4}$ (3) $\frac{7}{8}$ (4) $\frac{1}{4}$

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- Q.7** Three objects, A : (a solid sphere), B : (a thin circular disk) and C : (a circular ring), each have the same mass M and radius R. They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation [NEET 2018]

- (1) $W_C > W_B > W_A$ (2) $W_A > W_B > W_C$
(3) $W_B > W_A > W_C$ (4) $W_A > W_C > W_B$

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- Q.8** A light rod of length l has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

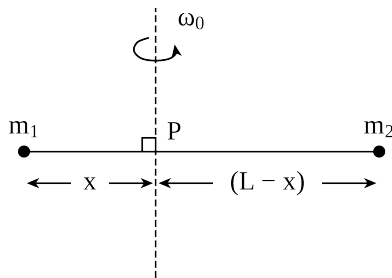
[NEET 2016 (Phase 2)]

- (1) $\frac{m_1 m_2}{m_1 + m_2} l^2$ (2) $\frac{m_1 + m_2}{m_1 m_2} l^2$
 (3) $(m_1 + m_2) l^2$ (4) $\sqrt{m_1 m_2} l^2$

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Q.9 Point masses m_1 and m_2 are placed at the opposite ends of a rigid rod of length L , and negligible mass. The rod is to be set rotating about an axis perpendicular to it. The position of point P on this rod through which the axis should pass so that the work required to set the rod rotating with angular velocity ω_0 is minimum, is given by [AIPMT 2015]



- (1) $x = \frac{m_2}{m_1} L$ (2) $x = \frac{m_2 L}{m_1 + m_2}$
 (3) $x = \frac{m_1 L}{m_1 + m_2}$ (4) $x = \frac{m_1}{m_2} L$

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Q.10 The ratio of radii of gyration of a circular ring and a circular disc, of the same mass and radius, about an axis passing through their centres and perpendicular to their planes are [NEET 2013 (Karnataka)]

- (1) $1 : \sqrt{2}$ (2) $3 : 2$ (3) $2 : 1$ (4) $\sqrt{2} : 1$

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Q.11 From a circular disc of radius R and mass $9M$, a small disc of mass M and radius $\frac{R}{3}$ is removed concentrically. The moment of inertia of the remaining disc about an axis perpendicular to the plane of the disc and passing through its centre is

[AIPMT 2010 (Mains)]

- (1) $\frac{40}{9} MR^2$ (2) MR^2
 (3) $4MR^2$ (4) $\frac{4}{9} MR^2$

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Q.12 Which one of the following pairs of statements is correct ?

- A. Centre of gravity (C.G.) of a body is the point at which the weight of the body acts
 B. Centre of mass coincides with the centre of gravity if the earth is assumed to have infinitely large radius.

- C. To evaluate the gravitational field intensity due to any body at an external point, the entire mass of the body can be considered to be concentrated at its C.G.
 D. The radius of gyration of any body rotating about an axis is the length of the perpendicular dropped from the C.G. of the body to the axis.

[AIPMT 2010 (Mains)]

- (1) D and A only (2) A and B only
 (3) B and C only (4) C and D only

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Q.13 A thin rod of length L and mass M is bent at its midpoint into two halves so that the angle between them is 90° . The moment of inertia of the bent rod about an axis passing through the bending point and perpendicular to the plane defined by the two halves of the rod is

[AIPMT 2008]

- (1) $\frac{ML^2}{6}$ (2) $\frac{\sqrt{2} ML^2}{24}$
 (3) $\frac{ML^2}{24}$ (4) $\frac{ML^2}{12}$

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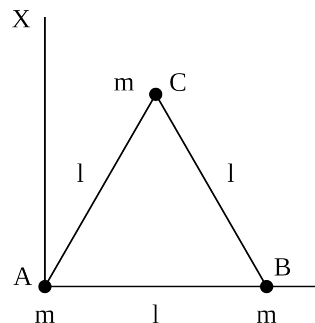
Q.14 The ratio of the radii of gyration of a circular disc to that of a circular ring, each of same mass and radius, around their respective axes is [AIPMT 2008]

- (1) $\sqrt{2} : 1$ (2) $\sqrt{2} : \sqrt{3}$
 (3) $\sqrt{3} : \sqrt{2}$ (4) $1 : \sqrt{2}$

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Q.15 Three particles, each of mass m gram, are situated at the vertices of an equilateral triangle ABC of side l cm (as shown in the figure). The moment of inertia of the system about a line AX perpendicular to AB and in the plane of ABC, in gram - cm^2 units will be [AIPMT 2004]



- (1) $\frac{3}{4} ml^2$ (2) $2ml^2$ (3) $\frac{5}{4} ml^2$ (4) $\frac{3}{2} ml^2$

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Q.16 A circular disc is to be made by using iron and aluminium so that it acquired maximum moment of inertia about geometrical axis. It is possible with

[AIPMT 2002]

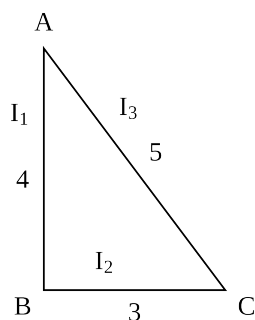
- (1) aluminium at interior and iron surround to it
- (2) iron at interior and aluminium surround to it
- (3) using iron and aluminium layers in alternate order
- (4) sheet of iron is used at both external surface and aluminium sheet as internal layers.

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Q.17 For the adjoining diagram (a uniform right-angled triangular plate ABC), the correct relation between I_1 , I_2 and I_3 is (I – moment of inertia about the marked side)

[AIPMT 2000]



- (1) $I_1 > I_2$ (2) $I_2 > I_1$ (3) $I_3 > I_1$ (4) $I_3 > I_2$

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ANSWER KEY

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	3	1	1	4	2	2	1	1	2	4	1
Ques.	12	13	14	15	16	17					
Ans.	1	4	4	3	1	2					