

System of Particles and Rotational Motion

NEET previous year questions · Physics

7 questions from the official papers: NEET 2026 (2), Re-NEET 2026 (3), NEET 2020 (2). Each is followed by its answer and a worked solution written by BrainIt. Generated on 23 October 2026.



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1. NEET 2026 · Q4

The angular speed of a flywheel is increased from 600 rpm to 1200 rpm in 10 s. The number of revolutions completed by the flywheel during this time is:

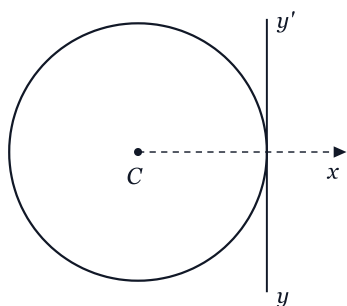
- (1) 900 (2) 600 (3) 150 (4) 300

Answer (3)

Sol. With uniform angular acceleration the number of revolutions equals the average angular speed times the time: $\frac{600+1200}{2} = 900$ revolutions per minute (rpm) over $\frac{10}{60}$ min = $\frac{1}{6}$ min, giving $900 \times \frac{1}{6} = 150$ revolutions, option (3). Equivalently, using $\omega_2^2 = \omega_1^2 + 2\alpha\theta$ gives $\theta = 300\pi$ rad, so $\theta/2\pi = 150$.

2. NEET 2026 · Q35

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:



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

Answer (2)

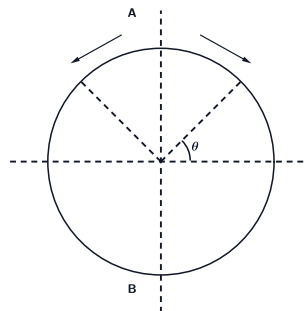
Sol. The ring's mass is $M = mL$ and its radius $r = L/2\pi$ (since $L = 2\pi r$). The axis yy' is tangential to the ring in its plane, so by the parallel axis theorem $I_{yy'} = I_{CM} + Mr^2 = \frac{1}{2}Mr^2 + Mr^2 = \frac{3}{2}Mr^2 = \frac{3}{2}(mL)\left(\frac{L}{2\pi}\right)^2 = \frac{3mL^3}{8\pi^2}$. The correct expression has L^3 and π^2 , eliminating the other options.

Why the other options are wrong:

- (1) Uses π instead of π^2 in the denominator.
- (3) Wrong power of L and π .
- (4) Wrong power of L .

3. Re-NEET 2026 · Q23

A frictionless circular wire of unit radius is fixed on the horizontal plane. Two-point particles of unit mass start moving simultaneously from point A ($\theta = \frac{\pi}{2}$) with identical uniform angular speeds in opposite directions, and meet again at point B ($\theta = -\frac{\pi}{2}$). During this time, which of the following figures schematically represent the magnitude of the total linear momentum P of the system, as a function of θ ?



- (1) (2)
 (3) (4)

Answer (3)

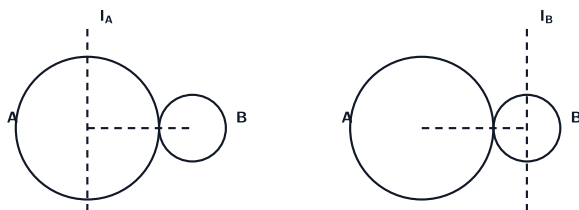
Sol. By symmetry the two particles sit at mirror-image angles about the vertical, so their tangential velocities have equal and opposite horizontal components while their vertical components add. Writing the particles at θ and $\pi - \theta$, the resultant works out to $P = 2m\omega r |\cos \theta|$, which is zero at the start ($\theta = \pi/2$), peaks when the particles are diametrically opposite the meeting point ($\theta = 0$), and returns to zero as they collide at B . That single smooth hump is option (3). NCERT Class 11, System of Particles and Rotational Motion (motion of the centre of mass).

Why the other options are wrong:

- (1) assumes momentum is conserved as a constant because the SPEEDS are constant, forgetting that momentum is a vector whose direction keeps changing
- (2) inverts the phase - takes $P \propto |\sin \theta|$, i.e. maximum where the particles start rather than where they are farthest apart
- (4) assumes P falls off linearly with angle instead of following the cosine of the half-separation

4. Re-NEET 2026 · Q27

A solid sphere A of radius R and mass M is attached at a point to a smaller solid sphere B of radius $r < R$ and mass $m < M$. Assume that the line joining their centres lies along the horizontal. The moment of inertia of the system calculated about a vertical axis passing through the centre of A is I_A and that calculated about a vertical axis passing through the centre of B is I_B . The difference $I_A - I_B$ is:



- (1) $(M - m)(R + r)^2$ (2) $(m - M)(R + r)^2$
 (3) $(m - M)(R - r)^2$ (4) 0

Answer (2)

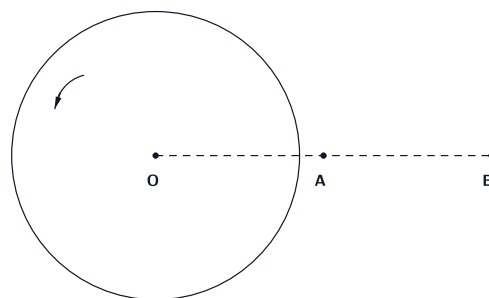
Sol. The spheres touch, so their centres are separated by $d = R + r$. About the axis through A : $I_A = \frac{2}{5}MR^2 + \frac{2}{5}mr^2 + md^2$; about the axis through B : $I_B = \frac{2}{5}MR^2 + \frac{2}{5}mr^2 + Md^2$. The two spin terms are common to both and cancel, leaving $I_A - I_B = (m - M)(R + r)^2$, a negative quantity as expected since the heavier sphere sits off-axis in the second case. NCERT Class 11, System of Particles and Rotational Motion (parallel axis theorem).

Why the other options are wrong:

- (1) gets the separation right but flips the sign - attaches the parallel-axis term to the wrong body in each case
- (3) uses $R - r$ as the centre separation, as if the small sphere were embedded in the large one rather than attached externally
- (4) assumes the moment of inertia is independent of the choice of axis, ignoring the parallel axis theorem altogether

5. Re-NEET 2026 · Q31

A thin horizontal disc is rotating about a vertical axis passing through its fixed centre O . Its angular momentum is L_A and L_B computed about points A and B , respectively, with $OB = 2 \times OA$. The value of $\frac{L_A}{L_B}$ is:



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

Answer (3)

Sol. The angular momentum of a rigid body about any point splits as $\vec{L} = \vec{L}_{cm} + \vec{r} \times M\vec{v}_{cm}$. Here the centre is FIXED, so $\vec{v}_{cm} = 0$ and the orbital term vanishes for every reference point. Only the spin term $I_{cm}\omega$ survives, which is the same whether you compute about A or B , so the ratio is 1 regardless of the distances. NCERT Class 11, System of Particles and Rotational Motion (angular momentum of a rotating rigid body).

Why the other options are wrong:

- (1) assumes $L \propto 1/r^2$, importing an inverse-square intuition that does not apply
- (2) assumes L scales inversely with the distance to the reference point
- (4) assumes L grows in proportion to the distance, as it would for a single particle moving in a straight line

6. NEET 2020 · Q165

Find the torque about the origin when a force $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

- (1) $6\hat{j}$ N m (2) $-6\hat{i}$ N m (3) $6\hat{k}$ N m (4) $6\hat{i}$ N m

Answer (2)

Sol. Torque $\tau = \vec{r} \times \vec{F} = (2\hat{k}) \times (3\hat{j}) = 6(\hat{k} \times \hat{j}) = -6\hat{i}$ N m.

Chapter: System of Particles and Rotational Motion.

7. NEET 2020 · Q180

Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass. The centre of mass of the system from the 5 kg particle is nearly at a distance of :

- (1) 50 cm (2) 67 cm (3) 80 cm (4) 33 cm

Answer (2)

Sol. The center of mass x_{CM} is given by $x_{CM} = \frac{m_1x_1+m_2x_2}{m_1+m_2}$. Substituting, $x_{CM} = \frac{5 \times 0 + 10 \times 100}{5+10} = \frac{1000}{15} \approx 67$ cm. Chapter: System of Particles and Rotational Motion.

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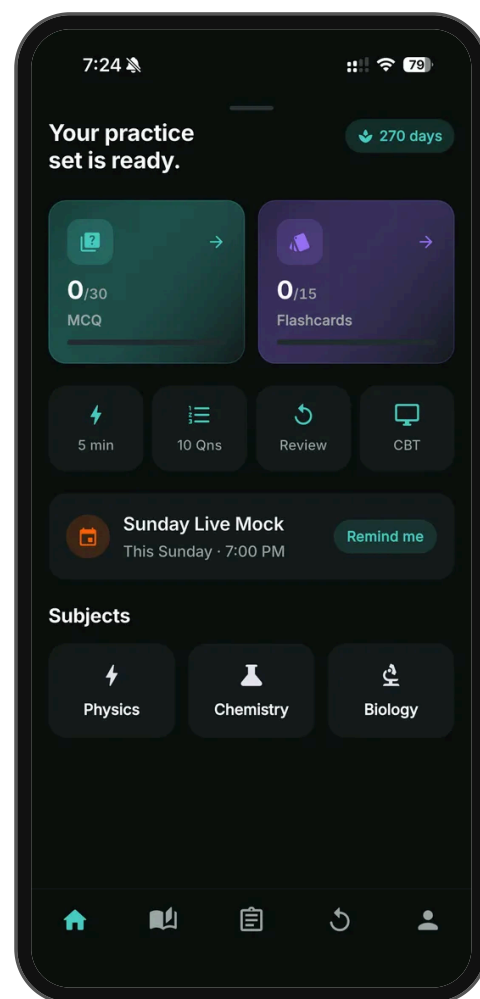
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