PHYSICS

BOOKS - NIKITA PHYSICS (HINGLISH)

ROTATIONAL MOTION

MULTIPLE CHOICE QUESTIONS

1. The position of center of mass of a system of particles does not depend upon the

A. masses of the particles

B. position of the particles

C. forces on the particles

D. relative distance between the particles

Answer: C

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2. Rotational motion can be

A. one or two dimensional

B. one or three dimensional

C. two or three dimensional

D. one dimensional

Answer: C

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3. A body is set into rotational motion due to

A. a force acting at a point on the body

B. equal and opposite forces acting at two different points on the same body

C. equal forces acting at two different points on the body

D. a force acting at the centre of the body

Answer: B

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4. The centre of mass of a symmetrical and uniform distribution of mass of a rigid body is

A. at the centre of the surface

B. outside the body

C. inside the body

D. at the geometric centre of the body

Answer: D

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5. The motion of centre of mass depends upon the total

A. external forces

B. internal forces

C. sum of 'a' and 'b'

D. none of these

Answer: A

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6. The point at which total mass of a body is suppose to be concentrated is known as

A. deep centre

B. centre of gravity

C. centre of mass

D. geometric contre

Answer: C

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7. In case of bodies of regular shapes, the centre of gravity coincides with the centre of

A. mass

B. equilibrium

C. gometric centre

D. both 'a' and 'c'

Answer: D

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8. Three identical metal balls each of radius r are placed touching each other on a horizontal surface such that an equilateral triangle is formed, when the center of three balls are joined. The center of mass of system is located at the

A. The horizontal surface

B. The line joining centres of any two balls

C. The centre of one of the balls

D. The point of intersection of the medians

Answer: D

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9. If the resultant of all external forces is zero, then velocity of centre of mass will be

A. zero

B. infinite

C. constant

D. either 'a' or 'c'

Answer: C

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10. A couple produces.

A. linear motion

B. rotational motion

C. translational motion

D. oscillatory motion

Answer: B

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11. A body is said to be rigid, if distance between any two position of the particle

A. changes with force

B. remains constant with the force

C. changes with the force initially and maximum force changes laterally

D. erratical changes with force

Answer: B

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12. The sum of moments of masses of all the particle in a system about the centre of mass is always

A. zero

B. maximum

C. infinite

D. minimum

Answer: A

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13. A point at which the whole mass of the body is supposed to be concentrated in order to studt the motion of an external force in accordance with Newton's laws of motion is

A. centre of gravity

B. weight of the body

C. centre of mass of a body

D. acceleration due to gravity acts on a body

Answer: C

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14. A body performs rotational motion about the given axis, particles perform U.C.M. with same angular velocity. The particles at different positions have

A. same velocity

B. constant velocity

C. different velocity

D. nothing can be said about velocity

Answer: C

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15. The centre of mass of a body lies

A. on its surface

B. inside the body

C. outside the body

D. 'b' and 'c'

Answer: D

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16. Two particles of masses 5 gm and 10 gm are 12 cm apart. What will be the location of the centre of mass of the system of these two particles from the lighter particle is ?

A. 8 cm

B. 6 cm

C. 4 cm

D. 9 cm

Answer: A

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17. Particles of masses 3 kg, 4 kg, 5 kg nd 2 kg are placed at points $A(3, 2), B(-2, 2), C(-2, -3)$ and

$D(1, -2)$ respectively of a co-ordinate system. The centre of mass of the system is at

A. $\left(-\frac{1}{2}, -\frac{1}{2}\right)$

B. $\left(-\frac{1}{2}, -\frac{5}{14}\right)$

C. $\left(0, -\frac{1}{2}\right)$

D. (0,0)

Answer: B

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18. A system consists of 3 particles each of mass 'm' are located at (1, 1) (2, 2) and (3, 3). The co-ordinates of the centre of mass are

A. (6, 6)

B. (2, 2)

C. (3, 3)

D. (1, 1)

Answer: B

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19. Two hydrogen atoms are located at the distances r_1 and r_2 from origin. Their centre of mass is at

A. $(r_1 - r_2)/2$

B. $r_1 - r_2$

C. $(r_1 + r_2)/2$

D. $r_1 + r_2$

Answer: C

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20. A body rolling on a horizontal plane is an example of

A. rotational motion

B. oscillatory motion

C. translation motion

D. rotational and translational motion

Answer: D

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21. The rotational motion of a body can be produced due to applying

A. torque

B. momentum

C. inertia

D. force

Answer: A

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22. Analogue of a force in a rotational motion, is

A. weight

B. torque

C. angular momentum

D. moment of inertia

Answer: B

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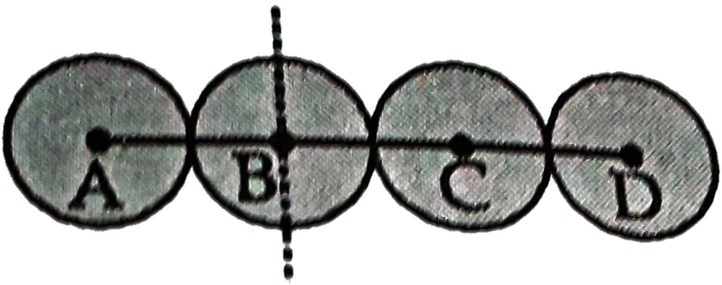
23. Four identical bodies each of mass 1 kg are placed touching to each other with centres on a straight line. If their centres are marked A, B, C and D respectively, then the distance of centre of mass of the system from B will be



A. $\frac{AB+BC+BC+CD}{4}$

B. $\frac{AB+BC+BD}{4}$

C. $AB+\frac{AC}{4}+AD$

D. $\frac{AB + BC + CD}{4}$

Answer: B

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24. Dimensions of moment of inertia are

A. $[L^2 M^2 T^{-1}]$

B. $[L^2 M T^0]$

C. $[L M T^{-1}]$

D. $[L^2 M T^{-2}]$

Answer: B

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25. If the moment of inertia of a rigid body is numerically equal to its mass, radius of gyration is

A. equal to its radius

B. equal to diameter

C. equal to one unit

D. infinite

Answer: C

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26. Moment of inertia in rotatory motion is comparable to the quantity in translatory motion

A. momentum

B. mass

C. weight

D. velocity

Answer: B

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27. A ring and a disc have same mass and same radius. Then ratio of moment of inertia of ring to the moment of inertia of disc is

A. 4

B. 2

C. 0.5

D. 1

Answer: B

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28. Moment of inertia comes into play

A. in transalatory motion

B. in rotatory motion

C. when the body is rest

D. in all these case

Answer: B

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29. If the angular velocity of a rotating rigid body is increased then its moment of inertia about that axis

A. increases

B. decreases

C. becomes zero

D. remains unchanged

Answer: D

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30. A ring of mass m and radius r is melted and then moulded into a sphere. The moment of inertia of the sphere will be

A. more than that of the ring

B. less than that of the ring

C. equal to that of the ring

D. the information given is incomplete

Answer: B

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31. A cycle wheel is fitted with spokes because

A. it increaases the strength of the wheel

B. it gives a bettwe shape to wheel

C. it increases the moment of inertia of wheel so that balance of cyclist is maintained

D. it decreases the moment of inertia of wheel so that less force is required on paddles to start the cycle

Answer: C

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32. A steel sphere and a wooden sphere have the same mass. Then which will have greater moment of inertia about the diameter ?

A. wooden sphere

B. steel sphere

C. same of both

D. can not be predicted

Answer: A

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33. An iron ball and a wooden ball have the same radius. Then which will have smaller moment of inertia about the diameter ?

A. wooden ball

B. iron ball

C. same for both

D. can not be predicted

Answer: A

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34. Moment of inertia of body depends upon

A. mass of the body

B. distribution of mass of rotation of the body about the axis

C. both 'a' and 'b'

D. neither 'a' nor 'b'

Answer: C

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35. Which of the following has the smallest moment of inertia about the central axis if all have equal mass and radii ?

A. Ring

B. Disc

C. Spherical shell

D. Solid sphere

Answer: D

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36. The moment of inertia is the property of a rotating rigid body possess in

A. linear motion

B. rotational motion

C. circular motion

D. all of these

Answer: B

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37. The following bodies have same mass which of them have largest M.I. ?

A. Ring - about an axis perpendicular to its plane

B. Disc - about an axis perpendicular to its plane

C. Solid sphere - about an axis passing through its centre

D. Bar magnet - about an axis through its centre and perpendicular to its plane

Answer: A

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38. Moment of inertia of a body does not depend on

A. mass of the body

B. distribution of the mass in the body

C. ais of rotation of the body

D. angular velocity of the body

Answer: D

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39. If the position of axis of rotation of a body is changed, then a physical quantity changes which is

A. Radius of gyration

B. Moment of inertia

C. both 'a' and 'b'

D. neither 'a' nor 'b'

Answer: C

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40. Thye angular momentum and the moment of inertia are respectively

A. vector and tensor quantities

B. scalar and vector quantities

C. vector and vector quantities

D. scalar and scalar quantities

Answer: A

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41. The mass of a flywheel is concentrated at its rim

A. to obtain a strong wheel

B. to decrease the moment of inertia

C. to increase the moment of inertia

D. to obtain the stable equilibrium

Answer: C

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42. A circular disc is to be made by using iron and aluminium, so that it acquires maximum moment of inertia about its geometrical axis. It is possible with

A. iron and aluminium layers in alternate order

B. aluminium at interior and iron surrounding ir

C. iron at interior and aluminium surrounding it

D. either 'a' or 'c'

Answer: B

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43. About which of the following axis, the moment of inertia of a thin circular disc is minimum ?

A. Through centre perpendicular to the surface

B. Tangential and perpendicular to the surface

C. Through centre parallel to the surface

D. Tangential and parallel to the surface

Answer: C

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44. The angular displacement of a flywheel varies with time as $\theta = at + bt^2 - ct^3$. Then the angular acceleration is given by

A. $a + 2bt - 3ct^2$

B. $2b - 6ct$

C. $a + 2b - 6t$

D. $2b - 6t$

Answer: B

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45. A ody is in pure rotation. The linear speed v of a particle, the distance r of the particle from the axis and the angular velocity ω of the body are related as $\omega = \frac{v}{r}$. Thus

A. $\omega \propto \frac{1}{r}$

B. ω is independent of r

C. $\omega = 0$

D. $\omega \propto r$

Answer: B

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46. Moment of inertia of a rigid body about an axis passing through its centre of mass is I_0 and moment of inertia of the same body about another axis parallel to the first axis is I. Then

A. I is always equal to I_0

B. I is always smaller than I_0

C. I is always greater than I_0

D. any of the above three

Answer: C

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47. In rotatory motion, moment of inertia

A. imparts angular acceleration

B. maintains state of rotational motion

C. opposes the change in rotational motion

D. 'b' and 'c'

Answer: D

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48. Two circular discs are of same thickness. The diameter of A is twice that of B. The moment of inertia of A as compared to that of B is

A. twice as large

B. four times as large

C. sixteen times as large

D. eight times of large

Answer: C

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49. A solid sphere, hollow sphere and ring have the same mass and diameter. If they rotate about axes passing through centre of gravity and in the case of ring it is normal to its plane, which will have more moment of inertia ?

A. Solid sphere

B. Hollow sphere

C. Ring

D. Same for all

Answer: C

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50. A steel ring and a wooden ring have the same mass. Then which will have smaller moment of inertia about the diameter ?

A. Wooden ring

B. Steel ring

C. Same of both

D. can not be predicted

Answer: B

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51. An iron disc and a wooden disc have the same radius. Then which will have larger moment of inertia about the diameter ?

A. Wooden disc

B. Iron disc

C. same for both

D. can not be predicted

Answer: B

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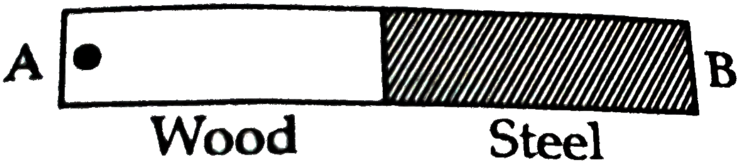
52. AB is a stick half of which is wood and the other half steel. I_A is moment of inertia about an axis passing through A and perpendicular to the length . I_B is moment of inertia about an axis passing through B and perpendicular to the length. Then



A. $I_A = I_B$

B. $I_A > I_B$

C. $I_B > I_A$

D. we can not say

Answer: B

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53. A solid sphere and hollow sphere of the same material have mass. Then moment of inertia about the diameter is more for

A. Solid sphere

B. Hollow sphere

C. same for both

D. none

Answer: B

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54. Which of the following has the largest moment of inertia about the central axis if all have equal mass and radii ?

A. Solid sphere

B. Disc

C. Spherical shell

D. Ring

Answer: D

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55. With the increase in temperate, moment of inertia of a solid sphere about the diameter.

A. decreases

B. increases

C. does not change

D. none of these

Answer: B

56. About which of the following axes moment of inertia of a disc circular disc is minimum ?

A. Axis passing through its centre and perpendicular to its plane.

B. Axis along the diameter.

C. Axis along the tangent and in its own plane

D. Axis along the tangent and perpendicular to its plane.

Answer: B

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57. If the moment of inertia of a rigid body is numerically equal to its mass, radius of gyration is

A. equal to its diameter

B. equal to its radius

C. $\sqrt{2}$ units

D. 1 unit

Answer: C

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58. If temperature increases, the moment of inertia of a solid sphere about its diameter

A. increases

B. decreases

C. remains unchanged

D. becomes negative

Answer: A

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59. Three particles of masses 1 kg, 2 kg and 3 kg are at distance 1 m, 2 m and 3 m from the axis of rotation. The moment of intertia of the system is

A. $24kgm^2$

B. $12kgm^2$

C. $36kgm^2$

D. $48kgm^2$

Answer: C

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60. Two bodies of masses 1 kg and 2 kg, separated by 6 m are rotating about the centre of mass of the system. The moment of inertia of the system is

A. $12kgm^2$

B. $24kgm^2$

C. $36kgm^2$

D. $6kgm^2$

Answer: B

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61. Two particles of masses m_1 and m_2 are separated by a distance 'd'. Then moment of inertia of the system about an axis passing through centre of mass and perpendicular the line joining them is

A. $\left(\frac{m_1 m_2}{m_1 + m_2}\right)\frac{d^2}{2}$

B. $\left(\frac{m_1 m_2}{m_1 + m_2}\right)d$

C. $\left(\frac{m_1 m_2}{m_1 + m_2}\right)d^2$

D. $\left(\frac{2m_1 m_2}{m_1 + m_2}\right)d^2$

Answer: C

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62. Two particles of masses 2 kg and 3 kg are separated by 5 m. Then moment of inertia of the system about an axis passing through the centre of mass of the system and perpendicular to the line joining them is

A. $10kgm^2$

B. $20kgm^2$

C. $30kgm^2$

D. $40kgm^2$

Answer: C

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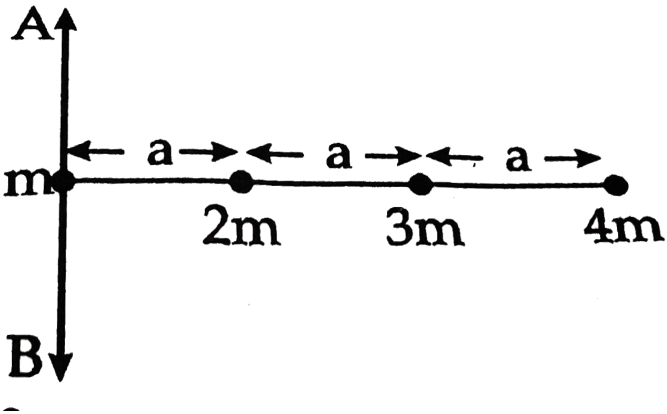
63. Four masses m, 2 m, 3 m and 4 m are connected by a rod of negligible mass. The moment of inertia of the system about the axis AB is



A. $52ma^2$

B. $9ma^2$

C. $50ma^2$

D. $20ma^2$

Answer: C

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64. Three particles each of 'm' are kept at the three vertices of an equilateral triangle of side 'a' . Moment of inertia of the system about an axis passing through the centroid and perpendicular to its plane is

A. $3ma^2$

B. ma^2

C. $ma^2/3$

D. $2/3ma^2$

Answer: B

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65. The square lamina of side 'b' has same mass as a disc of radius R. The M.I. of the two about an axis perpendicular to the plane and passing throught the centre are equal. The ratio b/R is

A. 1

B. $\sqrt{6}$

C. $\sqrt{3}$

D. $1/3$

Answer: C

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66. Two circular disc of same mass and thickness are made from metals having densities ρ_1 and ρ_2 respectively. The ratio of their moment of inertia about an axis passing through its centre is,

A. $\rho_1 : \rho_2$

B. $\rho_1 \rho_2 : 1$

C. $\rho_2 : \rho_1$

D. $1 : \rho_1 \rho_2$

Answer: C

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67. Moment of inertia of the earth about an axis passing through its centre of mass is (where R and ρ are radius and density of the earth respectively).

A. $(2/5)\pi R^5\rho$

B. $(2/3)\pi R^5\rho$

C. $(8/15)\pi R^5\rho$

D. $(4/15)\pi R^5\rho$

Answer: C

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68. A small hole is made in a disc of mass M and radius R at a distance $R/4$ from centre. The disc is supported on a horizontal peg through this hole. The moment of inertia of the disc about horizontal peg is

A. $MR^2/2$

B. $5MR^2/16$

C. $9MR^2/16$

D. $5MR^2/4$

Answer: C

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69. Two circular discs A and B have equal masses and uniform thickness but have densities ρ_1 and ρ_2 such that $\rho_1 > \rho_2$. Their moments of inertia is

A. $I_1 > I_2$

B. $I_1 > \; > I_2$

C. $I_1 < I_2$

D. $I_1 = I_2$

Answer: C

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70. The masses of two uniform discs are in the ratio $1:2$ and their diameters in the ratio $2:1$. The ratio of their moment, of inertia about the axis passing through their respective centres and perpendicular to their planes is

A. $1:1$

B. $1:2$

C. $2 : 1$

D. $1 : 4$

Answer: C

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71. If a body is lying in the Y-Z plane, then according to theorem of perpendiculr axes the correct expression will be

A. $I_z = I_x + I_y$

B. $I_y = I_x + I_z$

C. $I_x = I_y + I_z$

D. $I_y = I_z + Md^2$

Answer: C

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72. If the diameter of fly wheel is increases by 1%, then increase in its M.I. about an axis passing through centre and perpendicular to the plane will be

A. 1%

B. 0.5%

C. 2%

D. 4%

Answer: C

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73. The M.I. of two spheres of equal masses about their diameters are equal. If one of them is solid and other is hollow, the ratio of their radius is

A. $\sqrt{3} : \sqrt{5}$

B. $3 : 5$

C. $\sqrt{5} : \sqrt{3}$

D. $5 : 3$

Answer: C

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74. A ring and a thin hollow cylinder have the same mass and radius. If I_r and I_s represent their moment of inertia about their axes, then

A. $I_r = 2I_s$

B. $I_s = 2I_r$

C. $I_s = I_r$

D. none of these

Answer: C

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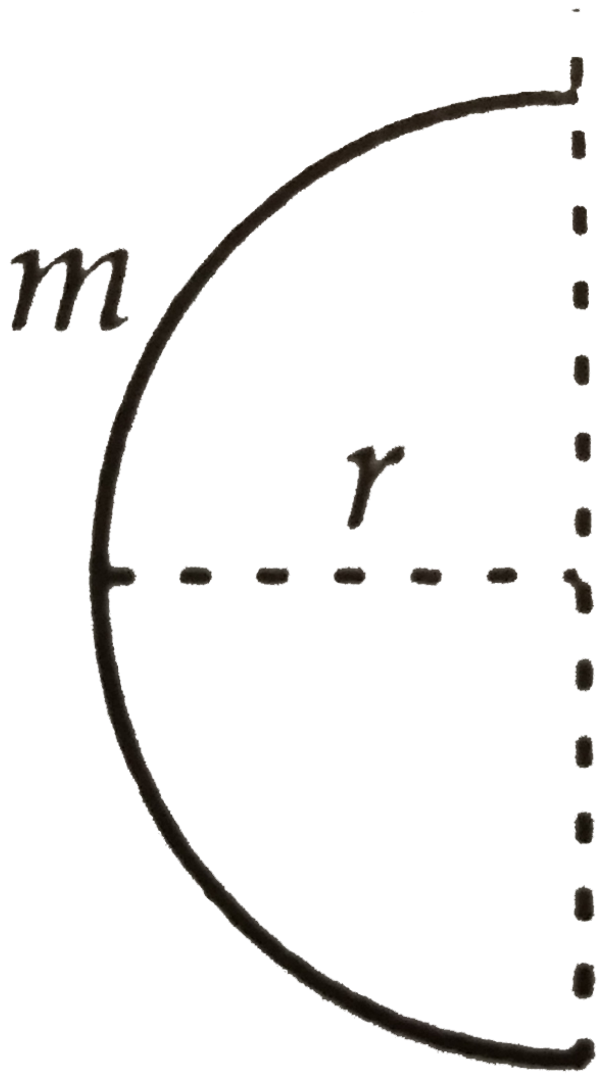
75. A thin wire of length l and mass m is bent in the form of a semicircle as shown in the figure. Its moment of inertia about an axis joining its free ends will be



A. ml^2

B. zero

C. ml^2 / π^2

D. $ml^2 / 2\pi^2$

Answer: D

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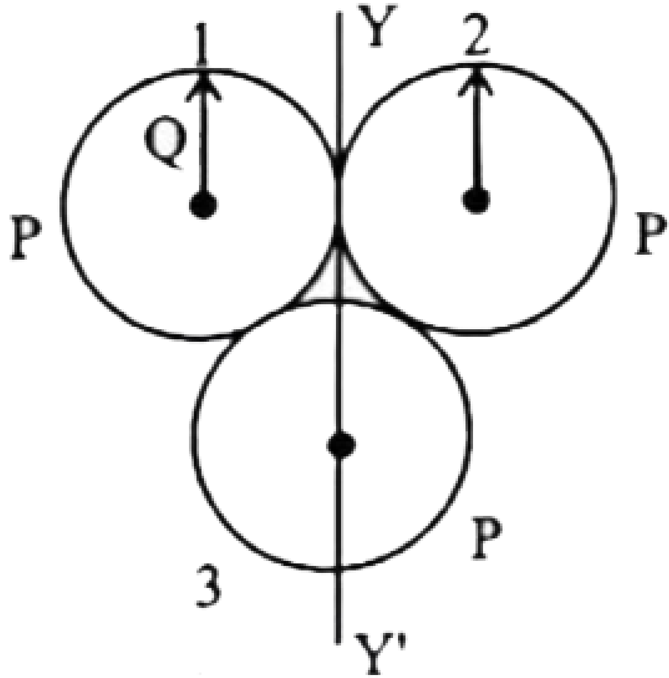
76. Three rings, each of mass P and radius Q are arranged as shown in the figure. The moment of inertia of the arrangement about

YY' axis will be



A. $(7/2)mR^2$

B. $(2/5)mR^2$

C. $(5/2)mR^2$

D. $(2/7)mR^2$

Answer: A

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77. If two masses of 200 g and 300 g are attached to the 20 cm and 70 cm marks on a light metre rod respectively, then the M.I. of the system about an axis passing through 50 cm mark will be

A. $0.15kgm^2$

B. $0.03kgm^2$

C. $0.3kgm^2$

D. zero

Answer: B

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78. RADIUS OF GYRATION

A. moment of force

B. moment of momentum

C. simple harmonic motion

D. moment of inertia

Answer: D

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79. The radius of gyration of a body depends upon

A. mass of the body

B. distribution of mass of the body

C. axis of rotation and distribution of mass of the body

D. all of the above

Answer: C

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80. The dimensions of the radius of gyration are

A. $[L^1M^1T^0]$

B. $[L^1M^0T^0]$

C. $[L^1M^0T^1]$

D. $[L^1M^2T^0]$

Answer: B

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81. A rod length 15 m stands vertically on the ground. With one end hinged to the ground. When it falls on the ground such that it rotates without slipping, the velocity of the upper tip on striking the ground is

A. 15 m/s

B. $15\sqrt{2}m/s$

C. $\frac{15}{\sqrt{2}}m/s$

D. $15\sqrt{3}m/s$

Answer: B

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82. The radius of gyration of a body about an axis at a distance of 4 cm from the centre of gravity is 5 cm. Its radius of gyration about a parallel axis through centre of gravity is

A. $\sqrt{31}cm$

B. 1 cm

C. 3 cm

D. none

Answer: C

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83. Radius of gyration of a body about an axis is 12 cm. Radius of gyration of the same body about a parallel axis passing through its centre of gravity is 13 cm. T?hen perpendicular distance between the two axes is

A. 5 cm

B. 1 cm

C. 15 cm

D. 10 cm

Answer: A

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84. The moment of inertia of a circular disc about its diameter is 500 kg m^2. If its radius is 2 m, than its radius of gyration is

A. 1 m

B. 2 m

C. $2\sqrt{2}m$

D. 4 m

Answer: A

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85. The radius of a solid sphere I 40 cm. The radius of gyration when the axis of rotation is along a tangent in a plane in cm is

A. $5\sqrt{35}$

B. $10\sqrt{35}$

C. $8\sqrt{35}$

D. $4\sqrt{35}$

Answer: C

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86. The radius of gyration of a disc of mass 100 g and radius 5 cm about an axis passing through its centre of gravity and perpendicular to the plane is

A. 0.5 cm

B. 2.5 cm

C. 3.54 cm

D. 6.54 cm

Answer: C

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87. Angular acceleration of a body of mass 50 kg under the action of a torque of magnitude 500 Nm is 25 rad/s^2. Then radius of gyration of the body about its axis of rotation is nearly equal to

A. 0.2 m

B. 0.6 m

C. 0.4 m

D. 1 m

Answer: B

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88. The angular speed of a body changes from ω_1 to ω_2 without applying a torque but due to change in its moment of inertia. The ratio of radii of gyration in the two cases is :-

A. $\omega_2 : \omega_1$

B. $\omega_2^{1/2} : \omega_1^{1/2}$

C. $\omega_2^2 : \omega_1^2$

D. $\frac{1}{\omega_2} : \frac{1}{\omega_1}$

Answer: B

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89. The radius of gyration of a disc about an axis coinciding with a tangent in its plane is

A. $\frac{R}{2}$

B. $\frac{R}{\sqrt{2}}$

C. $\sqrt{2}R$

D. $\frac{\sqrt{5}}{2}R$

Answer: D

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90. The radius of of disc is 2 m the radius of gyration of disc about an axis passing through its diameter is

A. 2 m

B. 2 cm

C. 1 m

D. 0.2 m

Answer: C

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91. A fly wheel of mass 4 kg has moment of inertia $16kgm^2$, then radius of gyration about the central axis perpendicular to its plane is

A. 1m

B. 2m

C. 4m

D. 16m

Answer: B

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92. The radius of gyration of a body about an axis at a distance of 6 cm from the centre of gravity is 10 cm. Its radius of gyration about a parallel axis through centre of gravity is

A. 4 cm

B. 14 cm

C. 8 cm

D. 16 cm

Answer: C

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93. The moment of inertia of a ring about its geometrical axis is I, then its moment of inertia about its diameter will be

A. 1 I

B. I/2

C. I

D. I/4

Answer: B

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94. Radius of gyration of a body an axis is 1 cm. Radius of gyration of the same body about a parallel axis passing through its centre of gravity is 2 cm. then perpendicular distance between the two axes is

A. $\sqrt{3}cm$

B. 1 cm

C. 4 cm

D. 1.5 cm

Answer: A

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95. The M.I. of a wheel of mass 8 kg and radius of gyration 25 cm is

A. $5kgm^2$

B. $1.5kgm^2$

C. $2.5kgm^2$

D. $0.5kgm^2$

Answer: D

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96. The angular momentum of two circular discs is same. The mass of the first disc is more than second disc then the rotational K.E. is more for

A. lighter disc

B. heavier disc

C. both will have same rotational K.E.

D. depends upon shape

Answer: A

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97. A cylinder full of water is rotating about its own axis with uniform angular velocity ω. Then the shape of free surface of water will be

A. parabola

B. elliptical

C. circular

D. spherical

Answer: A

Watch Video Solution

98. A solid sphere and a disc of same radii are falling along an inclined plane without slip. One reaches earlier than the other due to.

A. sizes

B. frictional force

C. moment of inertia

D. radius of gyration

Answer: D

Watch Video Solution

99. A body is rolling down an inclined plane. If kinetic energy of rotation is 40% of kinetic energy in translatory start then the body is a.

A. disc

B. Hollow sphere

C. Ring

D. Solid sphere

Answer: D

Watch Video Solution

100. When a body starts to roll on an inclined plane, its potential energy is converted into

A. rotational kinetic energy only

B. translational kinetic energy only

C. both 'a' and 'b'

D. neither 'a' nor 'b'

Answer: C

Watch Video Solution

101. Kinetic energy of a wheel rotating about its central axis is E. Then kinetic energy of another axis is E. Then kinetic energy of another wheel having twice the moment of inertia and half the angular momentum as that of the first wheel is

A. 8 E

B. 4 E

C. E/8

D. E/4

Answer: C

Watch Video Solution

102. The kinetic energy of rolling body is

A. $1/2I\omega^2$

B. $1/2I\omega^2 + 1/2mv^2$

C. $1/2mv^2$

D. $1/2mR^2$

Answer: B

Watch Video Solution

103. A loop of mass M and radius R is rolling on a smooth horizontal surface with speed 'v'. It's total kinetic energy is

A. $1/2Mv^2$

B. $3/2Mv^2$

C. Mv^2

D. $1/2MR^2\omega^2$

Answer: C

Watch Video Solution

104. A sphere of moment of inertia 'I' and mass 'm' rolls down on an inclined plane without slipping its K.E. of rolling is

A. $I\omega + mv$

B. $0.5mv^2$

C. $0.5I\omega^2$

D. $0.5I\omega^2 + 0.5mv^2$

Answer: D

Watch Video Solution

105. A fly wheel of mass 60 kg and radius 40 cm is revolving at 300 rpm, then its rotational K.E. is

A. $\dfrac{48}{\pi^2}J$

B. $480\pi J$

C. $\dfrac{48}{\pi}J$

D. $240\pi^2 J$

Answer: D

Watch Video Solution

106. A wheel of mass 8 kg and radius 40 cm is rolling on a horizontal road with angular velocity 15 rad/s. If moment of inertia of the wheel about its axis is $0.64 kgm^2$, then the rolling kinetic energy of wheel will be

A. 288 J

B. 216 J

C. 72 J

D. 144 J

Answer: B

Watch Video Solution

107. If a solid sphere of mass 500 gram rolls without slipping with a velocity of 20 cm/s, then the rolling kinetic energy of the sphere will be

A. 140 J

B. 280 J

C. 0.014 J

D. 0.028 J

Answer: C

Watch Video Solution

Watch Video Solution

108. The M.I. of a solid cylinder about its axis is I. It is allowed to rool down an incline plane without slipping. If its angular velocity at the bottom be ω, then kinetic energy of rolling cylinder will be

A. $I\omega^2$

B. $\frac{3}{2}I\omega^2$

C. $2I\omega^2$

D. $\frac{1}{2}I\omega^2$

Answer: B

Watch Video Solution

109. A rigid 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 revolution. After how many revolutions will the disc stop, if the retarding torque on it is also τ ?

A. n

B. 2n

C. 4n

D. n/2

Answer: A

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110. A coin is placed on a gramophone record rotating at a speed of 45 rpm, it flies away when the rotational speed is 50 rpm. If two such coins are placed one over the other on the same record both of them will fly away when rotational speed is

A. 100 rpm

B. 25 rpm

C. 12.5 rpm

D. 50 rpm

Answer: D

Watch Video Solution

111. If a disc of mass 400 gm is rolling on a horizontal surface with uniform speed of 2 m/s, then its rolling kinetic energy will be

A. 0.12 J

B. 1.2 J

C. 120 J

D. 12 J

Answer: B

Watch Video Solution

112. A particle of mass M and radius of gyration K is rotating with angular acceleration α. The torque acting on the particle is

A. $\frac{1}{2}mK^2\alpha$

B. $\frac{1}{4}mK^2\alpha$

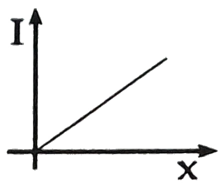
C. $2mK^2\alpha$

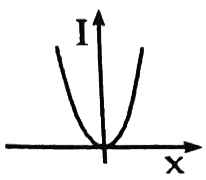
D. $mK^2\alpha$

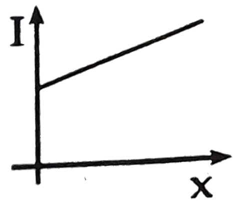
Answer: D

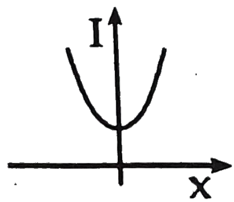
Watch Video Solution

113. If I is the M.I. of a solid sphere about an axis parallel to a diameter of the sphere and at a distance x from it, which of following graphs represents the variation of I with x

A. 

B. 

C. 

D. 

Answer: D

Watch Video Solution

114. If a circular loop of wire of mass 'm' and radius 'R' is making 'n' revolutions per second about a point on its rim perpendicular to the plane of the loop, Then its rotational kinetic energy will be

A. $\pi^2 mR^2 n^2$

B. $2\pi^2 mR^2 n^2$

C. $4\pi^2 mR^2 n^2$

D. $8\pi^2 mR^2 n^2$

Answer: C

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115. If the angular momentum of a body increases by 50%, its kinetic energy of rotation increases by

A. $50\ \%$

B. $25\ \%$

C. $125\ \%$

D. $100\ \%$

Answer: C

Watch Video Solution

116. A spherical solid ball of 1 kg mass and radius 3 cm is rotating about an axis passing through its centre with an angular velocity of 50 rad s^{-1}. The kinetic energy of rotation is

A. 9/20 J

B. 90 J

C. 910 J

D. 4500 J

Answer: A

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117. A wheel 2 kg having practically all the mass concentrated along the circumference of a circle of radius 20 cm is rotating on its axis with angular velocity of 100 rad/s, then the rotational kinetic energy of wheel is

A. 4 J

B. 70 J

C. 400 J

D. 800 J

Answer: C

Watch Video Solution

118. Two rigid bodies A and B rotate with angular momenta L_A and L_B respectively. The moments of inertia of A and B about the axes of rotation are I_A and I_B respectively. If $I_A = I_B/4$ and $L_A = 5L_B$, then the ratio of rotational kinetic energy K_A of A to the rotational kinetic energy K_B of B is given by

A. $25/4$

B. $5/4$

C. $1/4$

D. 100

Answer: D

Watch Video Solution

119. A body of moment of inertia of $3kgm^2$ rotating with an angular velocity of 2 rad/s has the same kinetic energy as that that of mass 12 kg moving with a velocity of

A. 1 m/s

B. 2 m/s

C. 4 m/s

D. 8 m/s

Answer: A

Watch Video Solution

120. A ring rotates without slipping on a horizontal smooth surface, the ratio of translational energy to the total energy of the ring is

A. 2

B. $1/2$

C. 4

D. $1/4$

Answer: B

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Watch Video Solution

121. A body of moment of inertia about its axis of rotation is $3kgm^2$ and angular velocity 3 rad/s. The kinetic energy of rotating body is same as that of body of mass 27 kg moving with a speed of

A. 1.0 m/s

B. 0.5 m/s

C. 1.5 m/s

D. 2.0 m/s

Answer: A

Watch Video Solution

122. A circular disc rolls down on an inclined plane. The fraction of its total rolling energy associated with its rotational energy is,

A. 1

B. $1/3$

C. $1/2$

D. $1/4$

Answer: B

Watch Video Solution

123. A body whose moment of inertia is $3\mathrm{kgm}^2$, is at rest. It is rotated for 20 s with a moment of force 6 Nm. Find the angular displacement of the body. Also calculate the work done.

A. 60 J

B. 2400 J

C. 120 J

D. 4800 J

Answer: B

Watch Video Solution

124. What fraction of translational kinetic energy of rolling circular disc to total kinetic energy ?

A. $1/3$

B. 1

C. $2/3$

D. $1/2$

Answer: C

Watch Video Solution

125. If a body starts rotating from rest because of a torque of 2 Nm, then its kinetic energy after 20 revolutions will be

A. $60\pi J$

B. $80\pi J$

C. $70\pi J$

D. $40\pi J$

Answer: B

Watch Video Solution

126. If a body starts rotating from rest due to a torque of 1.5 Nm, then its kinetic energy after it complete 20 revolution will be

A. $60\pi J$

B. $30\pi J$

C. $70\pi J$

D. $90\pi J$

Answer: A

Watch Video Solution

127. If a solid sphere of mass 1 kg rolls with linear speed of 1m/s, then the rolling kinetic energy will be

A. 0.7 J

B. 1.4 J

C. 2.1 J

D. 2.8 J

Answer: A

Watch Video Solution

128. The part of total kinetic energy is the rotational kinetic energy of a solid ball rolling over a horizontal plane is

A. $2/5$

B. $2/7$

C. $1/2$

D. $3/4$

Answer: B

Watch Video Solution

129. If a flywheel of mass m kg and radius r m is revolving at n rps, then the kinetic energy of rotation will be

A. $\pi^2 n^2 m^2 r^2$

B. $\pi^2 n^2 m^2 r$

C. $\pi^2 n^2 m r^2$

D. $\pi^2 n m^2 r^2$

Answer: C

Watch Video Solution

130. A thin ring and a solid disc of same mass and radius are rolling with the same linear velocity. Then ratio of their kinetic energies is

A. $4:3$

B. $3:4$

C. $2:3$

D. $3:2$

Answer: A

Watch Video Solution

131. When a solid sphere rolls without slipping on a surface, its rotational kinetic energy is 40 J. Then its total kinetic energy is

A. 100 J

B. 70 J

C. 140 J

D. 280 J

Answer: C

Watch Video Solution

132. A ring and a disc having the same mass, roll without slipping with the same linear velocity. If the kinetic energy of the ring is 8 j ,

Find the kinetic energy of disc (in J)

A. 2 J

B. 4 J

C. 6 J

D. 12 J

Answer: C

Watch Video Solution

133. A flywheel is in the form of solid circular wheel of mass 72 kg and radius of 0.5 m and it takes 70 rpm, then the energy of revolution is

A. 24 J

B. 2.4 J

C. 240 J

D. 2400 J

Answer: C

Watch Video Solution

134. The radius of gyration of flywheel is $(3/\pi)m$ and its mass is 1 kg. If the speed of the flywheel is changed from 20 rpm to 60 rmp, then the work done would be

A. 16 J

B. 12 J

C. 24 J

D. 32 J

Answer: A

Watch Video Solution

135. The radius of a wheel is R and its radius of gyration about its axis passing through its center and perpendicualr to its plane is K. If the wheel is roling without slipping. Then the ratio of tis rotational kinetic energy to its translational kinetic energy is

A. $\frac{k^2}{R^2}$

B. $\frac{R^2}{k^2}$

C. $\frac{k^2}{R^2 + k^2}$

D. $\dfrac{R^2}{R^2 + k^2}$

Answer: A

Watch Video Solution

136. Two bodies with moment of inertia l_1 and l_2 $(l_1 > l_2)$ have equal angular momentum. If E_1 and E_2 are the rotational kinetic energies, then

A. $E_1 = E_2$

B. $E_1 < E_2$

C. $E_1 > E_2$

D. $E_1 gr E_2$

Answer: B

Watch Video Solution

137. The rotational kinetic energy of a body is E. In the absence of external torque, the mass of the body is halved and its radius of gyration is doubled. Its rotational kinetic energy is

A. 2 E

B. E/2

C. E

D. E/4

Answer: B

Watch Video Solution

138. Angular momentum of body changes by 80 kg m^2 / s, when its angular velocity changes from 20 rad/s to rad/s. Then the change in its kinetic energy is

A. 1200 J

B. 1800 J

C. 1600 J

D. 2400 J

Answer: D

Watch Video Solution

139. A fly wheel rotating about a fixed axis has a kinetic energy of $360J$. When its angular speed is $30rads^{-1}$. The moment of inertia of the wheel about the axis of rotation is

A. $0.6kgm^2$

B. $0.8kgm^2$

C. $0.15kgm^2$

D. $0.75kgm^2$

Answer: B

Watch Video Solution

140. A disc of moment of inertia $9.8 / \pi^2 kgm^2$ is rotating at 600 rpm. If the frequency of rotation changes from 600 rpm to 300 rpm, then what is the work done ?

A. 1567 J

B. 1452 J

C. 1467 J

D. 1632 J

Answer: C

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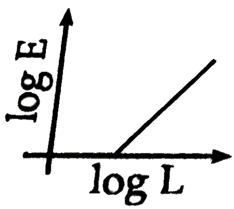
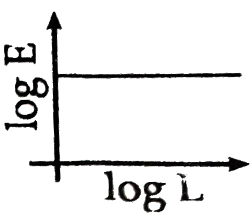
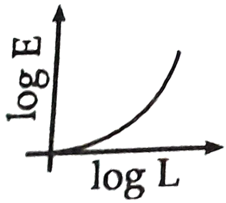
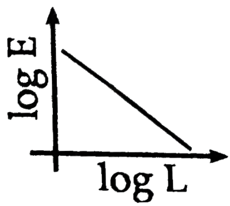
141. If the variation of rotational kinetic energy E with the angular momentum L of a body. The graph of log L and log E eill be in the form of

A. 

B. 

C. 

D. 

Answer: A

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142. A circular disc of mass 0.41 kg and radius 10 m rolls without slipping with a velocity of 2 m/s. The total kinetic energy of disc is

A. 0.41 J

B. 1.23 J

C. 0.82 J

D. 2.4 J

Answer: B

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143. If the angular momentum of a rotating body about an axis is increased by 10%. Its kinetic energy increases by

A. 20%

B. 21%

C. 10%

D. -21%

Answer: B

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144. If the kinetic energy of a rotating body about an axis is decreased by 36%, its angular momentum about that axis is

A. increases by 72%

B. decreases by 72 %

C. increases by 20%

D. decreases by 20%

Answer: D

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145. A boy stands on a freely rotating platform with his arms extended. His rotation speed is 0.3 rev/s, when he draws in, his speed increases to 0.5 rev/s, then the ratio of his moment of inertia in these two cases will be

A. $3:5$

B. $5:3$

C. $9:25$

D. $25:9$

Answer: B

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146. A rod of mass M and length l is suspended freely from its endandit canoscillate in the vertical plane about the point of suspension. It is pulled to one side and then released. It passes through the equilibrium position withangular speed ω . What is the kinetic energy while passing through the mean position ?

A. $\frac{Ml^2\omega^2}{2}$

B. $\frac{Ml^2\omega^2}{6}$

C. $\frac{Ml^2\omega^2}{4}$

D. $\frac{Ml^2\omega^2}{8}$

Answer: B

Watch Video Solution

147. A hollow sphere rolls on a horozontal surface without slipping. Then percentages of rotational kinetic energy in total energy is

A. 60%

B. 40%

C. 72%

D. 28%

Answer: B

Watch Video Solution

148. A hollow cylinder open at both ends slides without rotating, and then rolls without slipping with the same speed. The ratio of the kinetic energy in the two cases is (taken in order)

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:4$

Answer: B

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149. The kinetic energy of a body rotating at 300 revolutions per minute is 62.8 J. Its angular momentum (in kgm^2s^{-2}) is approximately

A. 1

B. 2

C. 4

D. 8

Answer: C

Watch Video Solution

150. The rotational kinetic energies of two flywheels are equal. If the ratio of their moments of inertia is 1 : 9 then the ratio of their angular momenta is

A. $5:1$

B. $1:2$

C. $2:1$

D. $1:4$

Answer: C

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151. A uniform rod of length l is held vertically on a horizontal floor fixing its lower end, the rod is allowed to fall onto the ground. Find (i) its angular velocity at that instant of reaching the ground (ii) The linear velocity with which the tip of rod hits the floor.

A. 4.9 J

B. 9.8 J

C. 19.6 J

D. 2.45 J

Answer: A

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152. The torque is a physical quantity which causes to produce

A. property of a body

B. linear motion of the body

C. rotational motion of the body

D. rolling motion of the body

Answer: C

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153. The dimensional formula of torque is same as that of

A. power

B. angular momentum

C. impulse

D. kinetic energy

Answer: D

Watch Video Solution

154. Force in linear motion is comparable to the quantity in rotatory motion is

A. moment of inertia

B. angular velocity

C. torque

D. impulse

Answer: C

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155. When same torque acts on two rotating rigid bodies to stop them, which have same angular momentum,

A. body with greater moment of inertia stops first

B. body with smaller moment of inertia stops first

C. both the bodies will be stopped after the same time

D. we can not predict which stops first

Answer: C

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156. When a steady toqrue or couple acts on a body, the body

A. continues in a state of rest or of steady motion by Newton's first law

B. gets linear acceleration by Newton's second law

C. continues to rotate at a steady rate

D. gets an angular acceleration

Answer: C

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157. The dimensions of torque are :

A. $[L^3 M^0 T^{-2}]$

B. $[L^2 M^2 T^{-3}]$

C. $[L^2 M^1 T^{-2}]$

D. $[L^2 M^{-1} T^{-3}]$

Answer: C

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158. If I, α and τ are the moment of inertia, angular acceleration and torque respectively of a body rotating about an axis with angular velocity ω then,

A. $\tau = I\alpha$

B. $\tau = I.\omega$

C. $\tau = I/\omega$

D. $\alpha = \tau.\omega$

Answer: A

Watch Video Solution

159. The relation between the torque τ and angular momentum L of a body of moment of inertia I rotating with angular velocity ω is

A. $\tau = dL/dt$

B. $\tau = L.\omega$

C. $\tau = dL/d\omega$

D. $\tau = L \times \omega$

Answer: A

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160. A fly wheel of M.I. $0.32 kgm^2$ is rotated steadily at 120 rad/s by 50 w electric motor. Then the value of the frictional couple opposing rotation is,

A. 4.2 Nm

B. 0.42 Nm

C. 0.042 Nm

D. 42 Nm

Answer: B

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161. A flywheel revolves at 100 rev/min, a torque is applied to the flywheel for 10 s If the torque increases the speed to 200 rev/min, then the angular acceleration of the flywheel will be

A. $\frac{\pi}{6} rad / s^2$

B. $\frac{\pi}{5} rad / s^2$

C. $\frac{\pi}{4} rad / s^2$

D. $\frac{\pi}{3} rad / s^2$

Answer: D

Watch Video Solution

162. The moment of inertia of a flywheel is $4kgm^2$. What angular acceleration will be produced in it by applying a torque of 10 Nm on it?

A. $4 rad / s^2$

B. $0.25 rad / s^2$

C. $25 rad / s^2$

D. $2.5 rad / s^2$

Answer: D

Watch Video Solution

163. If a wheel has mass 70 kg and radius of gyration 1 m, then the torque required an angular 1 m, then the torque required an angular acceleration of $2 \text{ rev} / s^2$ will be

A. $140\pi Nm$

B. $380\pi Nm$

C. $180\pi Nm$

D. $280\pi Nm$

Answer: D

Watch Video Solution

164. 8 kg wheel has radius of gyration (1/4) m. The torque required to give it an angular acceleration of 4 rad/s^2, is

A. $\frac{2}{3}Nm$

B. 2 Nm

C. $\frac{3}{2}Nm$

D. 3 Nm

Answer: B

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165. A disc of moment of inertia $3kgm^2$ is acted upon by a constant torque of 60 Nm, if the disc is at rest, then the time after which the angular velocity of the disc is 90 rad/s, will be

A. 1.5 s

B. 3 s

C. 4.5 s

D. 6 s

Answer: C

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166. A solid cylinder of radius 0.5 m and mass 50 kg is rotating at 300 rpm. Then the torque which will bring it to rest in 5 seconds is

A. $25\pi Nm$

B. $\frac{25\pi}{2}Nm$

C. $50\pi Nm$

D. $100\pi Nm$

Answer: B

Watch Video Solution

167. Two rigid bodies have the same angular momentum about their axes of symmetry. If the same torque is applied about their axes, then the ratio of the time after which they will be stopped

A. $1:1$

B. $1:2$

C. $2:1$

D. data is insufficient

Answer: A

Watch Video Solution

168. A disc of mass 16 kg and radius 25 cm is rotated about its axis. What torque will increase its angular velocity from 0 to 8π rad/s in 8 s ?

A. πNm

B. $\pi / 2Nm$

C. $\pi / 4Nm$

D. $2\pi Nm$

Answer: B

Watch Video Solution

169. If a torque of magnitude 100 Nm acting on a rigid body produces an angular acceleration of $2rad / s^2$, then the moment of inertia of that body will be

A. $50kgm^2$

B. $100kgm^2$

C. $200kgm^2$

D. $25kgm^2$

Answer: A

Watch Video Solution

170. A disc of moment of inertia $2kgm^2$ is acted upon by a constant torque of 40 Nm. If it is initially at rest, then the time taken by it to acquire an angular velocity 100 rad/s will be

A. 20 s

B. 10 s

C. 5 s

D. 4 s

Answer: C

Watch Video Solution

171. A shaft rotating at 6000 rpm is transmitting a power of 2π kilowatt. Then the magnitude of the driving torque is

A. 10 Nm

B. 5 Nm

C. 1 Nm

D. 0.1 Nm

Answer: A

Watch Video Solution

172. A wheel with moment of inertia 10 kg m^2 is rotating at $(2/\pi)$ rps on its axis. The frictional torque acting on it, if it makes 20 rotations befor stopping is

A. πNm

B. $1/\pi Nm$

C. $2\pi Nm$

D. $2/\pi Nm$

Answer: D

Watch Video Solution

173. A fly wheel is rotating with a kinetic energy of 200 J. A constant torque of 4 Nm acts on it to oppose its motion. Before coming to rest, the number of revolutions completed by it is

A. $100 / \pi$

B. $50 / \pi$

C. $25 / \pi$

D. $25 / \pi$

Answer: C

Watch Video Solution

174. An automobile egine develops 60π kilowatt of power when it is rotating at the speed of 1800 rev/min, then the torque it can transfer to the wheels is

A. 100 Nm

B. 10 Nm

C. 1000 Nm

D. 1800 Nm

Answer: C

Watch Video Solution

175. A thin rod of mass m and length $2L$ is made to rotate about an axis passing through its center and perpendicular to it. If its angular velocity changes from O to ω in time t, the torque acting on it is

A. $\dfrac{ml^2\omega}{l^2 t}$

B. $\frac{ml^2\omega}{3t}$

C. $\frac{ml^2\omega}{t}$

D. $\frac{4ml^2\omega}{3t}$

Answer: B

Watch Video Solution

176. A disc of radius 10 cm can rotate about an axis passing through its centre and perpendicular to its plane. A force of 10 N is applied along the tangent in the plane of the disc. If the moment of inertia of the disc about its centre is $5kgm^2$, then the increase in the angular velocity of the disc in 10 s will be

A. 2 rad/s

B. 4 rad/s

C. 1 rad/s

D. 50 rad/s

Answer: A

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177. A wheel of mass 40 kg and radius of gyrating 0.5 m comes to rest from a speed of 180 revolutions per minute in 3 s. Assuming that the retardation is uniform, then the value of retarding torque τ in Nm is

A. 10π

B. 20π

C. 30π

D. 40π

Answer: B

Watch Video Solution

178. A torque of 100 Nm acting on a wheel at rest, rotates it through 200 radians in 10 s. The angular acceleration of the wheel, in rad/s^2 is

A. 2

B. 4

C. 1

D. 8

Answer: B

Watch Video Solution

179. A disc of mass 2 kg and diameter 40 cm is free to rotate about an axis passing through its centre and perpendicular to its plane. If a force of 50 N is applied to the disc tangentially Its angular acceleration will be

A. $100 rad / s^2$

B. $25 rad / s^2$

C. $250 rad / s^2$

D. $500 rad / s^2$

Answer: C

Watch Video Solution

180. A wheel of mass 40 kg and radius of gyration 0.5 m comes to rest from a speed of 180 rpm in 30 s assuming that the retardation is uniform then the value of the retarding torque, in Nm will be

A. 1π

B. 3π

C. 2π

D. 4π

Answer: C

Watch Video Solution

181. A motor running at a rate of 1000 rpm can supply torque of 60 Nm, then the power developed is

A. 1π kwatt

B. 2π kwatt

C. 5π kwatt

D. 15π kwatt

Answer: B

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182. If a motor running at a rate of 1200 revolutions per minute can supply torque of 80 Nm, then the power required will be

A. 10π kwatt

B. 192π kwatt

C. 3.2π kwatt

D. 40π kwatt

Answer: C

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183. A rope is wound round a hollow cylinder of mass M and radius R. If the rope is pulled with a force F newton, then the angular acceleration of the cylinder will be

A. F/MR

B. M/F R

C. R/MF

D. MR/F

Answer: A

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184. A wheel of moment of inertia $2.0 \times 10^3 kgm^2$ is rotating at uniform angular speed of $4rads^{-1}$. What is the torque required to stop it in one second.

A. $8 \times 10^2 Nm$

B. $8 \times 10^4 Nm$

C. $8 \times 10^3 Nm$

D. $8 \times 10^5 Nm$

Answer: C

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185. Starting from rest, a fan takes five seconds to attain the maximum speed of 40 rpm(revolutions per minute). Asuming constant acceleration find the time taken by the fan in attaining half the maximum speed.

A. 20 s

B. 2.5 s

C. 10 s

D. 2.0 s

Answer: B

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186. If I_x and I_y are moment of inertia of the lamina in the plane and I_z is moment of inertia of the lamina perpendicular to the plane, then the mathematical statement of the principle of perpendicular

A. $I_x = I_y + I_z$

B. $I_z = I_x + I_y$

C. $I_y = I_x + I_z$

D. $I_z = 2I_x + I_y$

Answer: B

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187. Two flywheels of the same mass have radius R and r where $R > r$, and they have same rotational kinetic energy then the angular momentum (L) is more for

A. greater radius wheel

B. lesser radius wheel

C. both with have same L

D. depends upon shape L

Answer: A

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188. If all a sudden the radius of the earth increases, then

A. the angular than that of the earth will be greater than of the sun

B. the orbital speed of the earth will increase

C. the periodic time of the earth will increase

D. the energy and angular momentum will remain constant

Answer: C

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189. A person can balance easily on a moving bisycle but cannot balance on stationary bicycle. This is possible because of law of conservation of

A. mechanical energy

B. mass

C. angular momentum

D. linear momentum

Answer: D

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190. If the torque acting on a system is zero then, which of the followin quantities is conserced ?

A. linear momentum

B. angular momentum

C. moment of inertia

D. angular velocity

Answer: B

Watch Video Solution

191. If a gymnast sitting on a rotating disc with his arms out stretched suddenly lower his arms, then

A. angular velocity decreases

B. moment of inertia decreases

C. angular velocity remains constant

D. angular momentum decreases

Answer: B

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192. A particle moves with a constant velocity parallel to the X-axis. Its angular momentum with respect to the origin

A. is zero

B. remains constant

C. goes on increasing

D. goes on decreasing

Answer: B

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193. When a mass is rotating in a plane about a fixed point, its angular momentum is directed along.

A. radius

B. tangent to the orbit

C. axis of rotation

D. circumference of the circle

Answer: C

Watch Video Solution

194. A person is standing on a rotating wheel. If the sits on the wheel, then the angular momentum of the system will

A. increase

B. decrease

C. remain same

D. double

Answer: C

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195. A man stands at the centre of turn table and the turn table is rotating with certain angular velocity. If he walks towards rim of the turn table, then

A. moment of inertia of the system decreases

B. angular momentum of system increases

C. angular velocity of the system increases

D. kinetic energy of the system decreases

Answer: D

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196. A man turns on a rotating table with an angular velocity ω. He is holding two equal masses at arm's. Without moving his arms, he just drops the masses. Then his angular velocity

A. less than ω

B. more than ω

C. equal to ω

D. any of these three

Answer: B

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197. If polar ice caps melt, then the time duration of one day

A. increases

B. decreases

C. some times decreases, some times increases

D. remains constant

Answer: A

Watch Video Solution

198. Two rigid bodies have same moment of inertia about there axes of symmetry. Then which will have more kinetic energy ?

A. Body having greater angular momentum

B. Body having smaller angular momentum

C. Both will have same kinetic energy

D. Can not decided

Answer: A

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199. There are two identical spherical balls of same material one being solid and the other being hollow. Then they can be distinguished by

A. spinning them by applying rqual torques

B. rolling them down on the same inclined plane

C. determining their moments of inertia

D. any one of the three method mentioned above

Answer: D

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200. Angular momentum of the system of particles changes when

A. force acts on a body

B. torque acts on a body

C. direction of velocity changes

D. none of these

Answer: B

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201. The term moment of momentum is called

A. angular momentum

B. torque

C. force

D. couple

Answer: A

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202. Write the dimensional formula of angular momentum. Is it scale or vector ?

A. $\left[L^2M^1T^{-1}\right]$

B. $\left[L^1M^1T^{-1}\right]$

C. $\left[L^1M^1T^{-2}\right]$

D. $\left[L^1M^2T^{-1}\right]$

Answer: A

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203. If a body of mass 'm' and radius of gyration K rotates with angular velocity ω, then the angular momentum of the body will be

A. $m^2 k\omega$

B. $mk^2\omega$

C. $mk\omega^2$

D. $mk\omega$

Answer: B

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204. The angular momentum of a particle is

A. parallel to its linear momentum

B. perpendicular to its linear momentum

C. inclined to its linear momentum

D. a scalar quantity

Answer: B

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205. A heavy disc is rotating with uniform angular velocity ω about its own axis. A piece of wax sticks to it. The angular velocity of the disc will

A. increase

B. decrease

C. becomes zero

D. remain unchanged

Answer: B

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206. A body comes and sits suddenly on a circular rotating table the quantity which conserved is

A. angular velocity

B. angular momentum

C. linear momentum

D. angular acceleration

Answer: B

Watch Video Solution

207. If a person standing on a rotating disc stretches out his hands, the angular speed will

A. increases

B. decreases

C. become zero

D. remains constant

Answer: D

Watch Video Solution

208. Which of the following physical quantity has unit kgm^2 / s ?

A. Torque

B. Moment of inertia

C. Angular momentum

D. Force

Answer: C

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209. Relation between torque and angular momentum is similar to the relation between

A. energy and displacement

B. acceleration and velocity

C. mass and moment of inertia

D. force and liner momentum

Answer: D

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210. According to the principle of conservation of angular momentum, if moment of inertia of a rotating body decreases, then its angular velocity

A. decreases

B. increases

C. remains constant

D. becomes zero

Answer: B

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211. Before jumping into water from a height, a swimmer bend his body to

A. increase moment of inertia

B. decrease the angular momentum

C. decrease moment of inertia

D. reduces the angular velocity

Answer: C

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212. Angular momentum is vector product of

A. radius vector and linear momentum

B. linear momentum and angular velocity

C. momentum of inertia and angular acceleration

D. linear velocity and radius vector

Answer: A

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213. The angular momentum L, the linear momentum P and position vector 'r' are related as

A. $\overrightarrow{L} = \overrightarrow{r} \times \overrightarrow{P}$

B. $L = p/r$

C. $\overrightarrow{L} = \overrightarrow{P} \times \overrightarrow{r}$

D. L = p.r

Answer: A

Watch Video Solution

214. A fly wheel used in steam or diesel engine must have

A. large mass and moment of inertia

B. small mass and moment of inertia

C. large mass and small moment of inertia

D. large moment of inertia and small mass

Answer: D

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215. If the resultant external torque acting on a body is zero, then angular momentum of the body

A. changes

B. remains constant

C. is infinity

D. zero

Answer: B

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216. A dancer on ice spins faster when she folds her arms due to

A. increase in energy and increase in angular momentum

B. decrease in friction at the skates

C. constant angular momentum and increase in kinetic energy

D. increase in energy and decrease in angular momentum

Answer: C

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217. What is angular impulse ?

A. torque / time

B. torque $\times$ time

C. $1/2$ torque $\times$ time

D. torque $\times$ time^2

Answer: B

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218. A ballet dancer is rotating about his own vertical axis on smooth horizontal floor. I, ω, L, E are moment of inertia, angular velocity, angular momentum, rotational kinetic energy of ballet dancer respectively. If ballet dancer stretches himself away from his axis of rotation, then

A. L remains constant, I and K increase, ω decrease

B. L remains constant, I and K increase, ω increases

C. L remains constant, ω and K decrease, I increase

D. L remains constant ω and K increase, I decreases

Answer: D

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219. A small body is attached to one end of a string is revolved around a rod so that the string winds upon the rod and get shortend. The quantity which is conserved is

A. angular momentum

B. linear momentum

C. kinetic energy

D. potential enegy

Answer: A

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220. Raw and boiled eggs are made to spin on a smooth table by applying the same torque. The egg that spin faster is

A. raw egg

B. boiled egg

C. both will have the same rate of spin

D. difficult to predict

Answer: A

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221. A boiled egg and a raw egg of same mass and size are made to rotate about their own axis. If I_1 and I_2 are moments of inertia of boiled egg and raw egg, then

A. $I_1 > I_2$

B. $I_2 > I_1$

C. $I_1 = I_2$

D. $I_1 = \sqrt{3} I_2$

Answer: A

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222. If polar ice caps melt, then the time duration of one day

A. increases

B. decreases

C. becomes zero

D. remains constant

Answer: B

Watch Video Solution

223. Angular momentum is

A. a polar vector

B. an axial vector

C. a scalar

D. none of these

Answer: B

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224. The kinetic energy of a rotating body depends upon

A. angular speed

B. distribution of mass

C. both angular speed and distribution of mass

D. neither angular speed nor distribution of mass

Answer: C

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225. A boiled egg and a raw egg of same mass and size are made to rotate about their own axes. If I_2 are moments of inertia of boiled egg and raw egg respectively, ω_1 and ω_2 are their angular velocities respectively, then

A. $\omega_1 = \omega_2$

B. $\omega_1 > \omega_2$

C. $\omega_1 < \omega_2$

D. $\omega_2 = \sqrt{3}\omega_1$

Answer: B

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226. When a circular disc of radius 0.5 m is rotating about its own axis, then the direction of its angular momentum is

A. along the tangent drawn at every point

B. radial

C. perpendicular to the direction of angular velocity

D. along the axis of rotation of the body

Answer: D

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227. A circular of radius 20 cm is rotating about its own axis at an angular velocity ω .

The angular velocity of a particle 'A' which is at a distance 10 cm from the axis of rotation is

A. 2ω

B. $\omega/2$

C. ω

D. $\omega/4$

Answer: C

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228. A constant torque acting on a uniform circular disc changes its angular mkomentum from L to 4L/3 in 2 seconds. Then the magnitude of the torque applied is

A. L/3

B. 2L/3

C. 3L/2

D. L/6

Answer: D

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229. If a particle of mass 1 gm is moving along a circular path of radius 1 m with a velocity of 1 m/s, then the its angular momentum is

A. $1kgm^2/s$

B. $10^{-2}kgm^2/s$

C. $10^{-2}kgm^2/s$

D. $10^{-1}kgm^2/s$

Answer: B

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230. A hollow sphere and solid sphere of the same radius rotate about their diameters with the same angular velocity and angular momentum. Then the ratio of their masses is

A. $3:8$

B. $5:8$

C. $3:5$

D. $5:3$

Answer: C

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231. A constant torque acting on a uniform circular wheel changes its angular momentum from A_0 to $4A_0$ in 4 seconds. Find the magnitude of this torque.

A. 0.75A

B. 4A

C. A

D. 12A

Answer: A

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232. A particle performing uniform circular motion gas angular momentum L. If its angular frequency is double and its kinetic energy halved, then the new angular momentum is :

A. 4L

B. 0.5L

C. 2L

D. 0.25L

Answer: D

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233. A solid sphere of mass 2 kg and radius 5 cm is rotating at the rate of 300 rpm. The torque required to stop it in 2π revolutions is

A. 2.5×10^{4}dyne cm

B. 2.5×10^{-4} dyne cm

C. 2.5×10^{6} dyne cm

D. 2.5×10^{5} dyne cm

Answer: D

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234. The rotational kinetic energy of two bodies of moment of inertia $9kgm^{2}$ and

$1kgm^2$ are same . The ratio of their angular momenta is

A. $1:3$

B. $1:9$

C. $9:1$

D. $3:1$

Answer: D

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235. A wheel of moment of inertia $5 \times 10^{-3} kgm^2$ is making 20 revolutions per second. If it is stopped in 20 s, then its angular retardation would be

A. $\pi rad / s^2$

B. $4\pi rad / s^2$

C. $2\pi rad / s^2$

D. $8\pi rad / s^2$

Answer: C

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236. A wheel is rotating with frequency of 500 rpm on a shaft, second identical wheel initially at rest is suddenly coupled on same shaft. The frequency of the resultant combination is

A. 250 rps

B. 500 rps

C. 250 rpm

D. 500rpm

Answer: C

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237. If the radius of the earth contracts to half of its present value without change in its mass, what will be the new duration of the day?

A. 48h

B. 24h

C. 12h

D. 6h

Answer: D

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238. A thin circular ring of mass m and radius R is rotating about its axis with a constant angular velocity ω. 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 $\omega' =$

A. $\dfrac{\omega M}{M+m}$

B. $\dfrac{\omega(M-2m)}{(M+2m)}$

C. $\dfrac{\omega M}{M+2m}$

D. $\dfrac{\omega(M+2m)}{M}$

Answer: C

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239. Two discs of moments of inertia I_1 and I_2 about their respective axes (normal to the disc and passing through the centre), and rotating with angular speed ω_1 and ω_2 are brought into contact face to face with their axes of rotation coincident . What is the angular speed of the two-disc system ?

A. $\dfrac{I_1 + I_2}{I_1\omega_1 + I_2\omega_2}$

B. $\dfrac{I_1 + I_2}{I_1\omega_1 - I_2\omega_2}$

C. $\dfrac{I_1\omega_1 + I_2\omega_2}{I_1 + I_2}$

D. $\dfrac{I_1 - I_2}{I_1\omega_1 + I_2\omega_2}$

Answer: C

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240. A ring of mass m and radius R is rolling on a horizontal plane. If the ring suddenly starts rotating about its diameter, then its angular velocity in this will be

A. $\frac{V}{R}$

B. $\frac{2V}{R}$

C. $\frac{V}{2R}$

D. $\sqrt{2}\frac{V}{R}$

Answer: B

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241. A large disc has mass 2kg and radius 0.2 m and initial angular velocity 50 rad/s and small disc has mass 4kg and radius 0.1 m and initial angular velocity 200 rad/s both rotating about their common axis. Then the common final angular velocity after discs are in contact is,

A. 100 rad/s

B. 125 rad/s

C. 200 rad/s

D. 150 rad/s

Answer: A

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242. A man stands holding a weight in each hand and with his arms outstretched on a frictionless platform which is rotating at a speed of 1 revolution per sec. In ths position the total rotational intertia of the man, the weights and the platform is $6kgm^2$. If by drawing in his arms, the man decreases the rotational inertia of the system by $2kgm^2$, calcualte the resulting speed of the platform and the increase in kinetic energy. How do you account for the increase of kinetic energy?

A. 2 rps

B. 4 rps

C. 3 rps

D. 6 rps

Answer: C

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243. A ballet dancer spins about a vertical axis at 120 rpm with arms out stretched. With her arms fold the moment of inertia about the axis of rotation decreases by 40% . What is new rate of revolution?

A. 100 rpm

B. 150 rpm

C. 200 rpm

D. 250 rpm

Answer: C

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244. A disc rotates horizontal at the rate of 100 rpm and M.I. of the disc about the axis of rotation is $1kgm^2$. If a blob of molten wax weighing 50 gm drops gently at a distance 20 cm from the axis of rotation of the disc and remains stuck to it, then the increase in moment of inertia of the system will be

A. 2%

B. 0.2%

C. 0.02%

D. 20%

Answer: B

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245. The value of angular momentum of the earth rotating about its own axis is

A. $7 \times 10^{33} kgm^2 / s$

B. $7 \times 10^{33} kgm^2 / s$

C. $0.7 \times 10^{33} kgm^2 / s$

D. zero

Answer: A

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246. Angular momentum L and rotational kinetic energy K_R of a body are related to each other by the relation. (I = moment of inertia)

A. EI

B. $2\sqrt{EI}$

C. $\sqrt{2}EI$

D. E/I

Answer: C

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247. A torque of 50 Nm acts on a rotating body for 5 s. Its angular momentum is

A. increases by 250 kg m^2 / s

B. increases by 10 kg m^2 / s

C. increases by 55 kg m^2 / s

D. decreases by 250 kg m^2 / s

Answer: A

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248. A thin uniform circular disc of mass M and radius R is rotating in a horizontal plane about an axis passing through its centre and perpendicular to its plane with an angular velocity ω . Another disc of same dimensions but of mass $\frac{1}{4}$ M is placed gently on the first disc co-axially. The angular velocity of the system is

A. $\sqrt{2}\omega$

B. $4\omega / 5$

C. $3\omega / 4$

D. 4ω

Answer: B

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249. A body of mass 2 kg and radius of gyration 0.5 m is rotating about an axis. If its angular speed is 2 rad/s, then the angular momentum of the body will be

A. $1kgm^2 / s$

B. $3kgm^2 / s$

C. $2kgm^2 / s$

D. $4kgm^2 / s$

Answer: A

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250. Two rigid bodies with their moments of inertia in the ratio $2:3$ have same rotational kinetic energy . Then ratio of their angular momenta is

A. $2:3$

B. $3:2$

C. $\sqrt{2}:\sqrt{3}$

D. $\sqrt{3}:\sqrt{2}$

Answer: C

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251. Two wheels A and B are mounted on the same axle. Moment of inertia of A is 6 kg m^2 and is rotated at 600 rpm, when B is at rest.

What will be moment of inertia of B, if their combined speed is 400 rpm?

A. $8kgm^2$

B. $12kgm^2$

C. $3kgm^2$

D. $5kgm^2$

Answer: C

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252. A particle of mass m is rotating in a plane in circular path of radius r. Its angular momentum is L. The centripetal force acting on the particle is

A. $\dfrac{L^2}{M}R^3$

B. $M\dfrac{L^2}{R_3}$

C. $M\dfrac{R^3}{L^2}$

D. $\dfrac{L^2}{2}MR^3$

Answer: A

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253. If moment of inertia of a circular disc that makes 20 revolutions per second is 20 kg m^2 . Its angular momentum in kgm^2 / s

A. 2513

B. 400

C. 200

D. 1216

Answer: A

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254. If a uniform solid sphere of diameter 0.2 m and mass 10 kg is rotated about its diameter with an angular velocity of 2 rad/s, then the its angular momentum in kg m^2/s will be

A. 0.01

B. 0.02

C. 0.08

D. 0.04

Answer: C

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255. Mass remaining constant, if the earth suddenly contracts to one third of its present radius, the length of the day would be shorted by

A. 8/3h

B. 12h

C. 8h

D. 64/3 h

Answer: D

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256. If the radius of the earth decreases by 20% such that mass does not change, then the length of the new day would be

A. $\frac{24 \times 16}{25} h$

B. $\frac{24 \times 25}{16} h$

C. $\frac{25 \times 16}{24}h$

D. $\frac{24}{16}h$

Answer: A

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257. A uniform disc of mass M and radius R is rotating in a horizontal plane about an axis perpendicular to its plane with an angular velocity ω. Another disc of mass M/3 and radius R/2 is placed gently on the first disc coaxial. Then final angular velocity of the system is

A. $12\omega / 13$

B. $13\omega / 12$

C. $3\omega / 4$

D. $11\omega / 12$

Answer: A

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258. A dancer spins about himself with an angular speed ω, with his arms extended. When he draws his hands in, his moment of inertia reduces by 40% . Then his angular velocity would be

A. $3\omega / 4$

B. $4\omega / 5$

C. $5\omega / 4$

D. $5\omega / 3$

Answer: D

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259. A disc of mass 2 kg and radius 0.2 m is rotating about an axis passing through its centre and perpendicular to its plane with an angular velocity 50 rad/s . Another disc of mass 4 kg and radius 0.1m rotates about an axis passing through its centre and perpendicular to its plane with angular velocity 100 rad/s. If the two disc are coaxially coupled, then the angular velocity of coupled system would be

A. 150 rad/s

B. 120 rad/s

C. 100/3 rad/s

D. 200/3 rad/s

Answer: D

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260. The diameter of a disc is $1m$. It has a mass of $20kg$. It is rotating about its axis with a speed of 120 rotations in one minute. Its angular momentum in kgm^2 / s is

A. 13.4

B. 31.4

C. 41.4

D. 43.4

Answer: B

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261. $M.I.$ of a uniform horizontal solid cylinder of mass M about an axis passing through its edge and perpendicular to the axis of cylinder when its length is 6 times of its radius R is

A. $39M\frac{R^2}{4}$

B. $39M\frac{R}{4}$

C. $49M\frac{R}{4}$

D. $49M\frac{R^2}{4}$

Answer: D

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262. The moment of inertia of a circular ring about an axis passing through its diameter is I. This ring is cut then unfolded into a uniform straight rod. The moment of inertia of the rod about an axis perpendicular to its length passing through one of its ends is

A. $4\pi^2\frac{I}{3}$

B. $8\pi^2\frac{I}{3}$

C. $16\pi^2\frac{I}{3}$

D. $2\pi^2 \frac{I}{3}$

Answer: B

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263. A circular disc P of radius R is made from an iron plate of thickness t and another disc Q of radius

2R is made from an iron plate of thickness $\frac{t}{2}$.

The relation between their moments of inertia I_p and I_Q about their natural axes is

A. $I_Q = 4I_P$

B. $I_P = 8I_Q$

C. $I_P = 4I_Q$

D. $I_Q = 8I_P$

Answer: D

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264. Two solid sphere (A and B) are made of metals of different densities ρ_A and ρ_B respectively. If their masses are equal, the ratio of their moments of inertia $\left(\frac{I_A}{I_B}\right)$ about their respective diameter is

A. $\left(\frac{\rho_B}{\rho_A}\right)$

B. $\left(\frac{\rho_A}{\rho_B}\right)^{2/3}$

C. $\frac{\rho A}{\rho B}$

D. $\frac{\rho B}{\rho A}$

Answer: B

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265. The M.I. of a circular ring of radius R and mass M about a tangent in its plane is

A. $MR^2 / 2$

B. $3 / 2MR^2$

C. MR^2

D. $2MR^2$

Answer: C

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266. The moment of inertia of a uniform circular ring, having a mass M and a radius R, about an axis tangential to the ring and perpendicular to its plane, is

A. $MR^2 / 2$

B. $3 / 2MR^2$

C. MR^2

D. $2MR^2$

Answer: B

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267. The mass of a thin circular plate is M and its radius is R. About an axis in the plane of plate at a perpendicular distance $R/2$ from centre of plate, its moment of inertia is

A. $MR^2/2$

B. $3/2MR^2$

C. MR^2

D. $2MR^2$

Answer: D

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268. The M.I. of disc of mass M and radius 'R' about an axis passing through midway between centre and circumference and perpendicular to its plane is

A. $MR^2/2$

B. $MR^2/4$

C. MR^2

D. $5/4MR^2$

Answer: A

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269. The moment of inertia of a disc of mass M and radius R about a tangent to its rim in its plane is

A. $MR^2/2$

B. $5/4MR^2$

C. MR^2

D. $3/2MR^2$

Answer: D

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270. The moment of inertia of a disc of mass M and radius R about a tangent to its rim in its plane is

A. $MR^2 / 2$

B. $MR^2 / 4$

C. MR^2

D. $5 / 4MR^2$

Answer: D

Watch Video Solution

271. The M.I. of disc of mass M and radius 'R' about an axis passing through midway between centre and circumference and perpendicular to its plane is

A. $MR^2/2$

B. $5/4MR^2$

C. MR^2

D. $3/4MR^2$

Answer: D

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272. The moment of inertia of a straight thin rod of mass M and length l about an axis perpendicular to its length and passing through its one end, is

A. Ml^2

B. $Ml^2 / 3$

C. $Ml^2 / 2$

D. $Ml^2 / 12$

Answer: B

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273. The M.I. of thin uniform rod of mass 'M' and length 'l' about an axis passing through its centre and perpendicular to its length is

A. Ml^2

B. $Ml^2 / 3$

C. $Ml^2 / 2$

D. $Ml^2 / 12$

Answer: D

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274. The M.I. of a rectangular plane lamina of mass M, length 'l' and breadth 'b' about an axis passing through its centre and perpendicular to plane of lamina is

A. $\frac{Ml^2}{12}$

B. $\frac{Mb^2}{12}$

C. $\frac{M(l^2+b^2)}{12}$

D. $\frac{M}{12}\left(\frac{l^2}{b^2}+\frac{b^2}{4}\right)$

Answer: C

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275. If I_1, I_2 and I_3 are the moments of inertia about the natural axies of solid sphere, hollow sphere and a spherical shell of same mass and radii, the correct result of the following is

A. $I_1 > I_2 > I_3$

B. $I_3 > I_2 > I_1$

C. $I_2 > I_1 > I_3$

D. $I_2 = I_3 > I_1$

Answer: D

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276. The M.I. of solid sphere of mass M and radius R about its diameter is

A. $\frac{2}{5}MR^2$

B. $\frac{7}{5}MR^2$

C. $\frac{2}{3}MR^2$

D. $\frac{5}{3}MR^2$

Answer: A

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277. The M.I. of a solid sphere of mass 'M' and radius 'R' about a tangent in its plane is

A. $\frac{2}{5}MR^2$

B. $\frac{7}{5}MR^2$

C. $\frac{2}{3}MR^2$

D. $\frac{5}{3}MR^2$

Answer: B

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278. The radius of gyration of a solid sphere of radius R about its tangential is

A. $\sqrt{2}/3R$

B. $\sqrt{5}/3R$

C. $\sqrt{2}/5R$

D. $\sqrt{7}/5R$

Answer: D

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279. A body of mass m slides down an incline and reaches the bottom with a velocity v. If the same mass were in the form of a ring which rolls down this incline, the velocity of the ring at the bottom would have been

A. v

B. $\frac{v}{\sqrt{2}}$

C. $\sqrt{2}v$

D. $\frac{\sqrt{2}}{5}v$

Answer: B

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280. Moment of inertia of a solid cylinder of length L and diameter D about an axis passing through its centre of gravity and perpendicular to its geometric axis is

A. $M\left(\frac{D^2}{4}+\frac{L^2}{12}\right)$

B. $M\left(\frac{L^2}{16}+\frac{D^2}{8}\right)$

C. $M\left(\frac{D^2}{4}+\frac{L^2}{6}\right)$

D. $M\left(\frac{L^2}{12}+\frac{D^2}{16}\right)$

Answer: D

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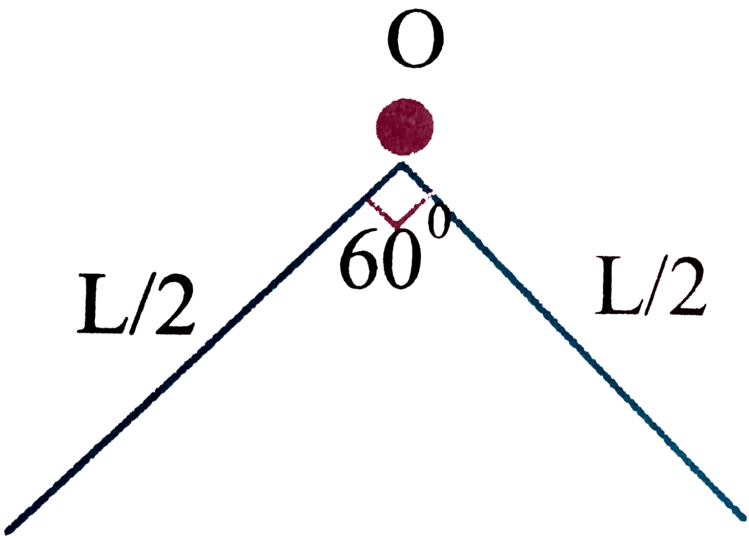
281. A thin rod of length L of mass M is bent at the middle point O at an angle of 60°. The moment of inertia of the rod about an axis passing through O and perpendicular to the plane of the rod will be



A. $M\frac{L^2}{6}$

B. $M\frac{L^2}{12}$

C. $M\frac{L^2}{24}$

D. $M\frac{L^2}{3}$

Answer: B

Watch Video Solution

282. Moment of inertia of a uniform circular disc about a diameter is I. Its moment of inertia about an axis perpendicular to its plane and passing through a point on its rim will be.

A. 5I

B. 3 I

C. 6 I

D. 4 I

Answer: C

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283. The moment of inertia of a solid sphere of mass M and radius R, about its diameter is $(2/5)MR^2$. Its M.I. about parallel axis passing through a point at a distance (R/2) from its centre is

A. $\frac{15}{20}MR^2$

B. $\frac{7}{5}MR^2$

C. $\frac{13}{20}MR^2$

D. $\frac{8}{15}MR^2$

Answer: C

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284. The moment of inertia of a thin rod of mass M and length L about an axis perpendicular to the rod at a distance L/4 from one end is

A. $\frac{19ML^2}{48}$

B. $\frac{38ML^2}{48}$

C. $\frac{7ML^2}{48}$

D. $\frac{ML^2}{12}$

Answer: C

Watch Video Solution

285. Three identical rods, each of mass m and length l are placed along x, y and z axis respectively. One end of each rod is at the origin. The moment of inertia of the rods x-axis will be

A. ml^2

B. $\frac{5ml^2}{3}$

C. $\frac{2ml^2}{3}$

D. $\frac{ml^2}{3}$

Answer: C

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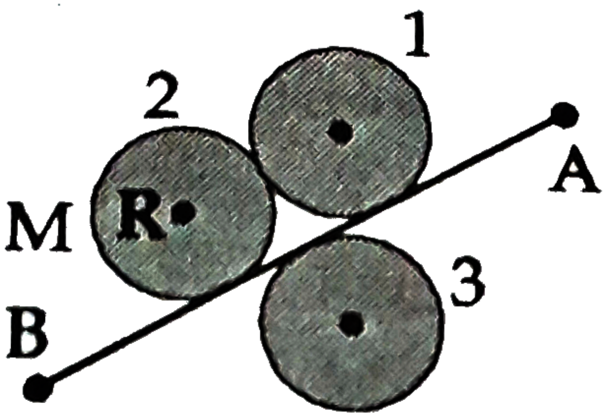
286. Three identical solid discs, each of mass M and radius R, are arranged as shown in figure. The moment of inertia of the system about an axis AB will be



A. $\frac{11}{4}MR^2$

B. $\frac{15}{4}MR^2$

C. $\frac{13}{4}MR^2$

D. $\frac{21}{5}MR^2$

Answer: B

Watch Video Solution

287. If the moment of inertia of a ring about transverse axis passing through its centre is 6 kg m^2, then the M.I. about a tangent in its plane will be

A. $3kgm^2$

B. $9kgm^2$

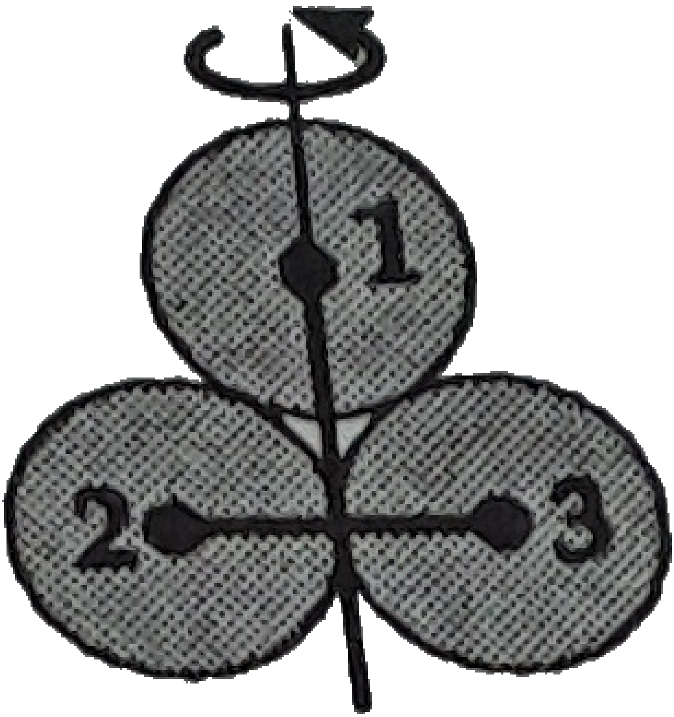
C. $6kgm^2$

D. $12kgm^2$

Answer: B

Watch Video Solution

288. Three spheres, each mass M and radius R, are arranged as shown in the figure . The moment of inertia of the system will be



A. $21 / 5MR^2$

B. $16/5MR^2$

C. $7/2MR^2$

D. $4/5MR^2$

Answer: B

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289. What is the moment of inertia os a solid sphere of radius 3 cm and density 3 g/cm^3 about its diameter in C.G.S. system?

A. 148π

B. 388π

C. 138π

D. 216π

Answer: B

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290. Three point masses, each of mass 2kg are placed at the corners of an equilateral triangle of side 2m. What is moment of inertia of this system about an axis along one side of a triangle?

A. $2kgm^2$

B. $4kgm^2$

C. $6kgm^2$

D. $8kgm^2$

Answer: B

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291. Three point masses, each of mass 2kg are placed at the corners of an equilateral triangle of side 2m. What is moment of inertia of this system about an axis along one side of a triangle?

A. $2kgm^2$

B. $4kgm^2$

C. $6kgm^2$

D. $8kgm^2$

Answer: C

Watch Video Solution

292. If the position of axis of rotation of a body is changed, then a physical quantity changes which is

A. radius of gyration

B. moment of inertia

C. total mass

D. both 'a' and 'b'

Answer: D

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293. The moment of inertia of a ring about one of its diameter is $2kgm^2$. What will be its moment of inertia about a tangent parallel to the diameter?

A. $2kgm^2$

B. $6kgm^2$

C. $4khm^2$

D. $5kgm^2$

Answer: B

Watch Video Solution

294. If ρ is density of the material of a sphere of radius R . Then its moment of inertia about its diameter is

A. $\frac{8\pi}{15}\rho R^5$

B. $\frac{4\pi}{3}\rho R^5$

C. $\frac{2\pi}{5}\rho R^5$

D. $\frac{4\pi}{3}\rho R^4$

Answer: A

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295. The moment of inertia of ring about an axis passing through its diameter is I. Then moment of inertia of that ring about an axis passing through its centre and perpendicular to its plane is

A. $I/4$

B. $I/2$

C. I

D. $2I$

Answer: D

Watch Video Solution

296. Moment of inertia of a rigid body about an axis through its centre of gravity is $10 kgm^2$. If mass of the body about an axis parallel to the first axis and separated by a distance of 1m is

A. $12kgm^2$

B. $8kgm^2$

C. $4kgm^2$

D. $2kgm^2$

Answer: A

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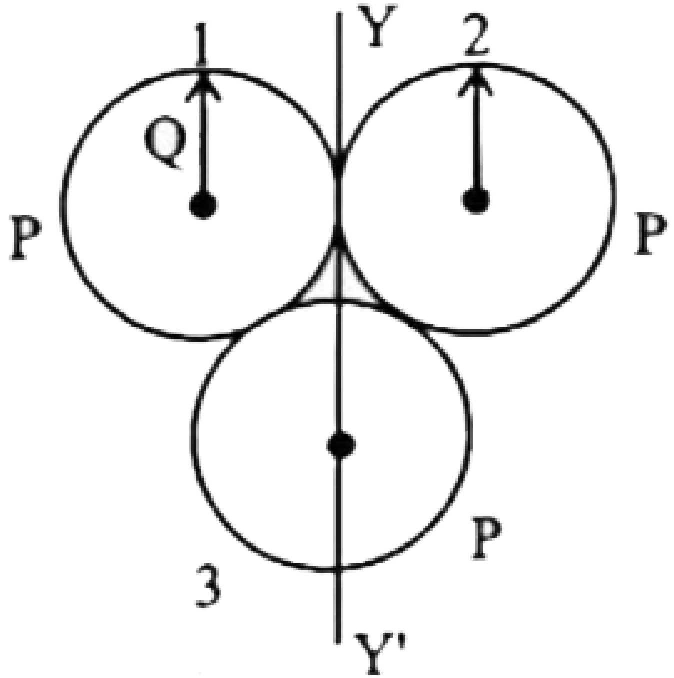
297. Three rings, each of mass P and radius Q are arranged as shown in the figure. The moment of inertia of the arrangement about

YY' axis will be



A. $(7/2)PQ^2$

B. $(2/7)PQ^2$

C. $2/4PQ^2$

D. $(5/2)PQ^2$

Answer: A

Watch Video Solution

298. If moment of inertia of a solid sphere of mass 5kg about its diameter is $50kgm^2$. Its moment of inertia about its tangent in kg m^2 is

A. 260

B. 250

C. 240

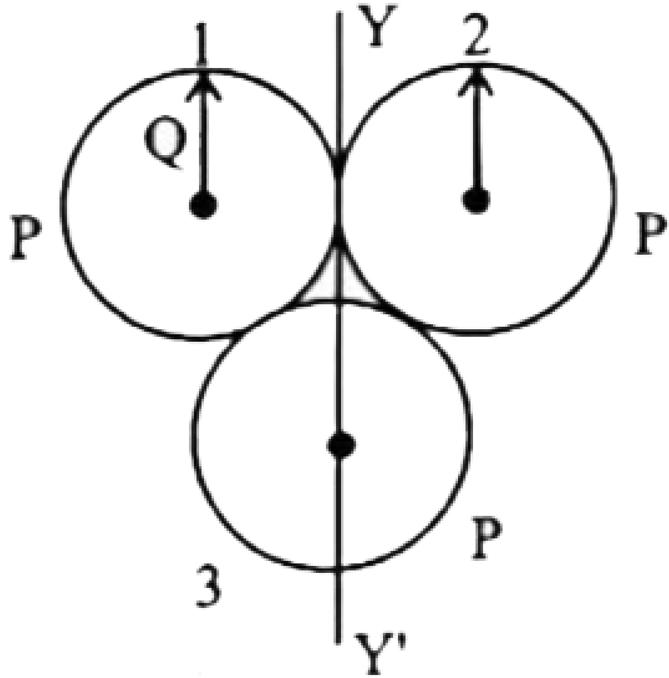
D. 175

Answer: D

Watch Video Solution

299. Three rings, each of mass P and radius Q are arranged as shown in the figure. The moment of inertia of the arrangement about

YY' axis will be



A. $(7/4)MR^2$

B. $(11/4)MR^2$

C. $(15/4)MR^2$

D. $(19/4)MR^2$

Answer: C

Watch Video Solution

300. The moment of inertia of a disc an axis passing through its centre and perpendicular to its plane is I kg m^2 . Its moment of inertia about an axis coincident with the tangent to it is

A. I

B. $\frac{5}{4}I$

C. $\frac{5}{2}I$

D. $3I$

Answer: D

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301. Two rings of the same mass and radius are placed such that their centers 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 diameter of one of the rings is I .

Then moment of inertia of one of the ring of the system about the central axis and perpendicular to its plane would be

A. 3I

B. $3I/2$

C. 2I

D. $2I/3$

Answer: A

Watch Video Solution

302. Moment of inertia of a thin uniform rod about an axis passing through one end perpendicular to its length is I . Then moment of inertia the same rod about the central axis perpendicular to its plane is

A. $I/4$

B. 2I

C. 4I

D. 3 I

Answer: A

Watch Video Solution

303. A thin wire of mass m and length l is bent in the form of a ring . Moment of inertia of that ring about an axis passing through its centre and perpendicular to its through its centre and perpendicular to its plane is

A. $ml^2/4\pi$

B. $ml^2/2\pi$

C. $ml^2 / 4\pi^2$

D. $ml^2 / 2\pi^2$

Answer: C

Watch Video Solution

304. Two solid spheres of different materials have the same moments of inertia about their diameters. If r_1 and r_2 are their radii, ratio of their densities is

A. $r_1^3 : r_2^3$

B. $r_2^3 : r_2^3$

C. $r_1^5 : r_2^5$

D. $r_2^5 : r_1^5$

Answer: D

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305. Moment of inertia of a solid sphere about its diameter is I . If that sphere is recast into 8 identical small spheres, then moment of inertia of such small sphere about its diameter is

A. $I/8$

B. $I/16$

C. $I/24$

D. $I/32$

Answer: D

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306. Particles each of mass 1kg are placed at 1m, 2m and 4m on X-axis with respect to origin. Then moment of inertia of the system about Y-axis is

A. $7kgm^2$

B. $14kgm^2$

C. $21kgm^2$

D. $28kgm^2$

Answer: C

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307. The M.I. of the solid sphere of density 'rho' and radius 'R' about an axis passing through its centre is given by

A. $\frac{105}{176}R^2\rho$

B. $\frac{176}{105}R^2\rho$

C. $\frac{176}{105}R^5\rho$

D. $\frac{105}{132}R^2\rho$

Answer: C

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308. The M.I. of a thin uniform stick of mass 9 gm about an axis passing through one end perpendicular to the length of a meter stick is

A. $90gmcm^2$

B. $9kgm^2$

C. $3gmm^2$

D. $9.8kgm^2$

Answer: C

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309. The moment of inertia of a circular disc about an axis passing through its centre and perpendicular to the plane is $4kgm^2$. Its moment of inertia about the diameter is

A. $2kgm^2$

B. $6kgm^2$

C. $4kgm^2$

D. $8kgm^2$

Answer: A

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310. If a uniform solid sphere of radius R and mass m rotates about a tangent and has moment of inertia $42 kgm^2$, then the moment of inertia of a solid sphere about an axis passing through its center and perpendicular to its plane will be

A. $12 kgm^2$

B. $18kgm^2$

C. $300kgm^2$

D. $24kgm^2$

Answer: A

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311. A solid sphere and a solid cylinder having the same mass and radius, rolls down the same incline. The ratio of their acceleration will be

A. $\frac{15}{14}$

B. $\frac{11}{14}$

C. $\frac{13}{14}$

D. $\frac{17}{14}$

Answer: A

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312. Two spheres each mass M and radius R are connected with massless rod of length 2R . Then moment of inertia of the system about an axis passing through the centre of one of sphere and perpendicular to the rod will be

A. $\frac{21}{5}MR^2$

B. $\frac{23}{5}MR^2$

C. $\frac{22}{5}MR^2$

D. $\frac{24}{5}MR^2$

Answer: D

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313. A circular disc of radius R and thickness $R/6$ has moment of inertia I about an axis passing through its centre and perpendicular to its plane. It is melted and recast into a solid sphere. The $M.I$ of the sphere about its diameter as axis of rotation is

A. I

B. $\frac{I}{5}$

C. $\frac{I}{10}$

D. $\frac{2I}{8}$

Answer: B

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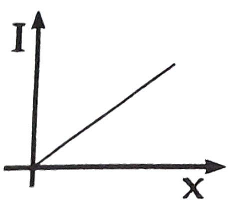
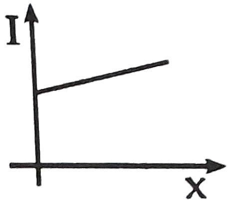
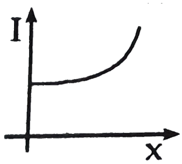
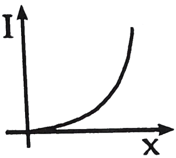
314. The moment of inertia of a solid sphere, about an axis parallel to its diameter and at a distance of x form it is, 'I(x)'. Which one of the graphs represents the variation of 'I(x) with x correctly ?

A. 

B. 

C. 

D. d) 

Answer: C

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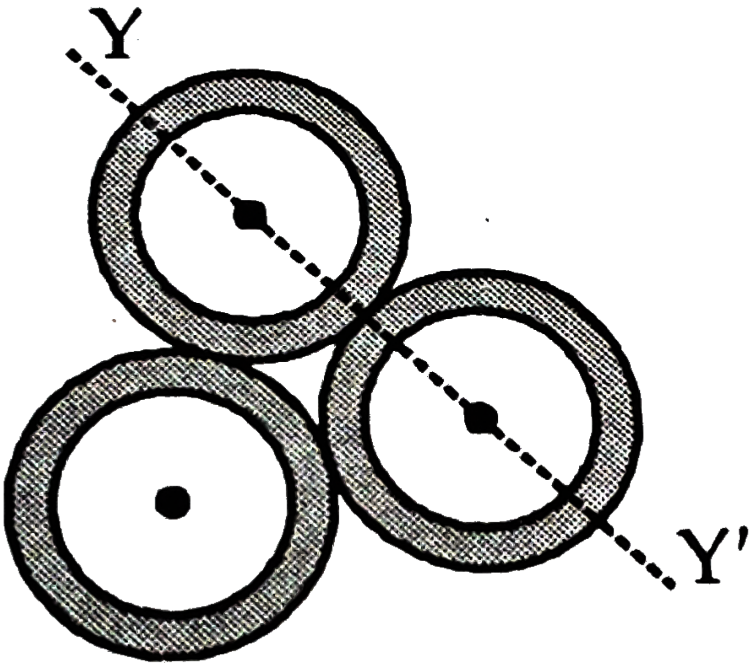
315. Three rings each of mass M and radius R are placed in contact with each other as shown . Then MI of the system about YY' axis is



A. MR^2

B. $\frac{1}{2}MR^2$

C. $\frac{3}{2}MR^2$

D. $\frac{9}{2}MR^2$

Answer: D

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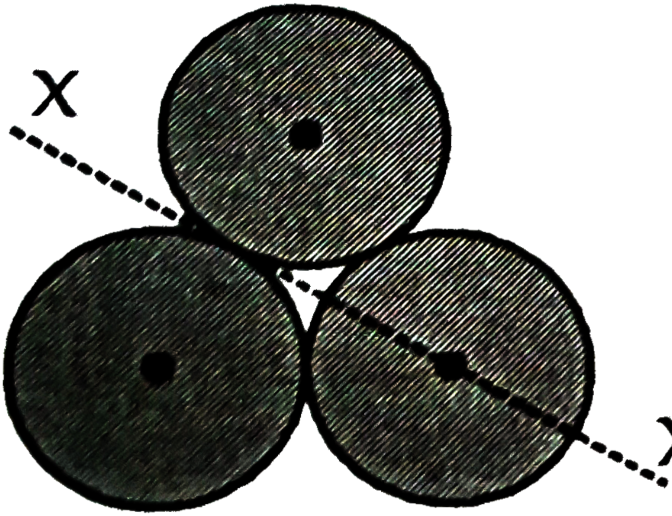
316. Three discs each of mass M and radius R are placed in contact with each other as shown in figure here. Then the MI of the system about an axis XX' is



A. $\dfrac{11}{2}MR^2$

B. $\dfrac{11}{4}MR^2$

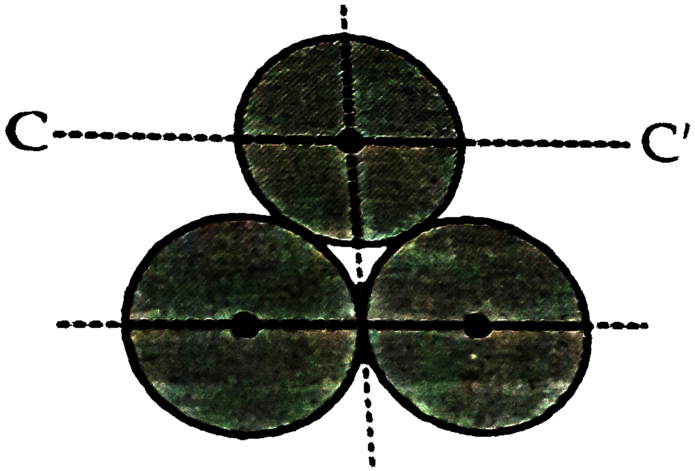
C. $\dfrac{7}{2}MR^2$

D. $\dfrac{7}{4}MR^2$

Answer: B

Watch Video Solution

317. Thee spheres each of mass M and radius R are placed in contact with each other as shown in the figure here. Then the moment of inertia of the system about the axis CC' is



A. $\frac{15}{2} MR^2$

B. $\frac{27}{4} MR^2$

C. $\frac{36}{5} MR^2$

D. none of the above

Answer: C

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318. A disc and a hoop of the same and size roll down on inclined plane starting simultaneously. Then the one which reaches bottom first

A. hoop

B. disc

C. depends upon angle of incline

D. both

Answer: B

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319. A sphere is rolled on a rough horizontal surface. It gradually slows down and stops. The force of friction tries to

A. decrease the linear velocity

B. increase the angular velocity

C. increase the linear momentum

D. decrease the angular velocity

Answer: A

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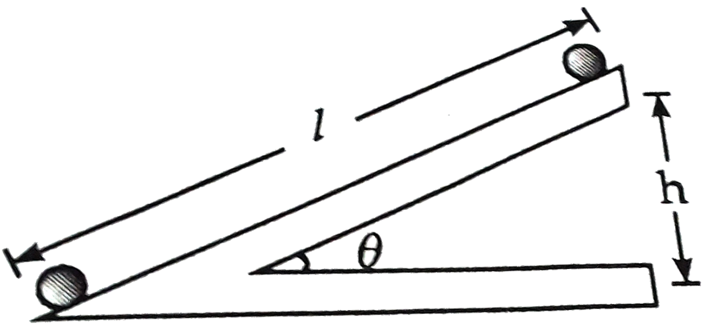
320. A and B are two identical rings released from the top of an inclined plane . A slides down and B rolls down. Then which reaches the bottom first ?



A. A

B. B

C. both in same time

D. none of these

Answer: A

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321. In the above problem No. 320, which will reach the bottom with greater velocity?

A. A

B. B

C. both will same velocity

D. none of these

Answer: A

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322. In rotatory motion, linear velocities of all the particles of a body

A. are same

B. are different

C. can not be predicted

D. are zero

Answer: B

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323. The correct statement about angular momentum is

A. directly proportional to moment of inertia

B. a scalar quantity

C. inversely proportional to moment of

D. its direction always is tangential at a point

Answer: A

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324. When a body starts to roo on an inclined plane, its potential energy is converted into

A. translational kinetic energy only

B. rotational kinetic energy only

C. both translational and rotational kinetic energies

D. neither translational nor rotational kinetic energies

Answer: C

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325. If the angular momentum of any rotating body increases by 200%, then the increase in its kinetic energy

A. 400%

B. 800%

C. 200%

D. 100%

Answer: B

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326. Solid sphere, hollow sphere, solid cylinder and hollow cylinder of same mass and same radii are simultaneously start rolling down from the top of an inclined plane. The body that takes longest time to reach the bottom is

A. solid sphere, hollow sphere

B. solid sphere, disc

C. ring, solid sphere

D. solid sphere, ring

Answer: D

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327. In the above question No.326, the reason for the bodies to have different times of descent is

A. they have same mass

B. they have same radius

C. they have different radii of gyration

D. all

Answer: C

View Text Solution

328. If a body is rolling on a surface without slipping such that its kinetic energy of translation is equal to kinetic energy of rotation then it is a

A. ring

B. disc

C. spherical shell

D. sphere

Answer: C

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329. If a ring, disc, hollow sphere and solid sphere rolling horizontally without slipping with the same velocity on a surface, then translational kinetic energy is more for

A. ring

B. disc

C. sphere

D. we can not say

Answer: D

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330. A ring, disc, hollow sphere and solid sphere roll on a horizontal surface with the same linear speed. If they have same mass and radius and move without slipping, rotational kinetic energy is more for

A. ring

B. disc

C. hollow sphere

D. solid sphere

Answer: A

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331. A ring, disc, spherical shell and solid sphere of same mass and radius are rolling on a horizontal surface without slipping with same velocity. If they move up an inclined plane, which can reach to a maximum height on the inclined plane?

A. ring

B. disc

C. spherical shell

D. solid sphere

Answer: A

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332. A solid sphere and a solid cylinder having the same mass and radius, rolls down the same incline. The ratio of their acceleration will be

A. $15 : 14$

B. $14 : 15$

C. $5 : 7$

D. $7 : 5$

Answer: B

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333. Total kinetic energy of a rolling solid spher of mass m with velocity is

A. $\frac{1}{2}mv^2$

B. $\frac{1}{5}mv^2$

C. $\frac{7}{10}mv^2$

D. $\frac{7}{5}mv^2$

Answer: C

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334. A circular hoop rolls down an inclined plane. The ratio of its total energy to rotational kinetic energy is

A. $2:1$

B. $1:3$

C. $3:1$

D. $4:1$

Answer: A

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335. A solid sphere rolls without slipping down a 30° inclined plane. If $g = 10ms^{-2}$ then the acceleration of the rolling sphere is

A. $5ms^{-2}$

B. $\frac{7}{25}ms^{-2}$

C. $\frac{25}{7}ms^{-2}$

D. $\frac{15}{7}ms^{-2}$

Answer: C

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336. A cylindrical ring is rolling without slipping. The ration of rotational and translational kinetic energies is

A. 0.25

B. 0.5

C. 1

D. 1.5

Answer: C

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337. A solid cylinder of mass 0.1 kg having radius 0.2m rolls down an inclined plane of height 0.6m without slipping. The linear velocity the cylinder at the bottom of the inclined plane is

A. $28 ms^{-1}$

B. $2.8 ms^{-1}$

C. $280 ms^{-1}$

D. $0.28 ms^{-1}$

Answer: B

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338. A circular disc first rolls without slpping and then slides without rolling down the same inclined plane. The ratio of velocities of the disc at the bottom of the plane in both the cases respectively is

A. $2 : \sqrt{3}$

B. $\sqrt{3} : 2$

C. $\sqrt{2} : \sqrt{3}$

D. $3 : 2$

Answer: C

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339. A circular ring starts rolling down on an inclined plane from its top. Let v be velocity of its centre of mass on reaching the bottom of inclined plane. If a block starts sliding down on an identical inclined plane but smooth, from its top, then the velocity of block on reaching the bottom of inclined plane is

A. $\sqrt{3}v$

B. $\frac{v}{\sqrt{3}}$

C. $\frac{v}{\sqrt{2}}$

D. $\sqrt{2}v$

Answer: D

Watch Video Solution

340. A hollow cylinder and a solid cylinder having the same mass and diameter are released from rest simultaneously from the top of an inclined plane. They roll without slipping which will reach the bottom firstly

A. the solid cylinder

B. the hollow cylinder

C. both will reah the bottom together

D. can not be predicted

Answer: A

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341. A string is wrapped several times round a solid cylinder. Then free end of the string is held stationary. If the cylinder is released to move down, then the acceleration of that cylinder is

A. $g/3$

B. $g/2$

C. $3g/2$

D. $2g/3$

Answer: D

Watch Video Solution

342. An inclined plane makes an angle 30° with the horizontal. A solid sphere rolling down this inclined plane from rest without slipping has a linear acceleration equal to

A. $2g/7$

B. $5g/7$

C. $g/7$

D. $5g/14$

Answer: D

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Watch Video Solution

343. A uniform ring rolls on a horizontal surface with out slipping. Its centre of mass moves with a constant speed v. then speed of the upper most point on its rim above the ground is

A. v

B. 2v

C. $v/2$

D. $\sqrt{2}v$

Answer: B

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344. Two loops P and Q are made from a uniform wire. The redii of P and Q are r_1 and r_2 respectively, and their moments of inertia are I_1 and I_2 respectively, If $I_2 = 4I_1$, then $\frac{r_2}{r_1}$ equals-

A. $4^{2/3}:1$

B. $1:4^{1/3}$

C. $1:2$

D. $4^{-1/2}:1$

Answer: B

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345. A ring of mass 10 kg and diameter 0.4m is rotated about an axis passing through its centre and perpendicular to its plane moment of inertia of the ring is

A. $1.4kgm^2$

B. $2.4kgm^2$

C. $0.4kgm^2$

D. $2kgm^2$

Answer: C

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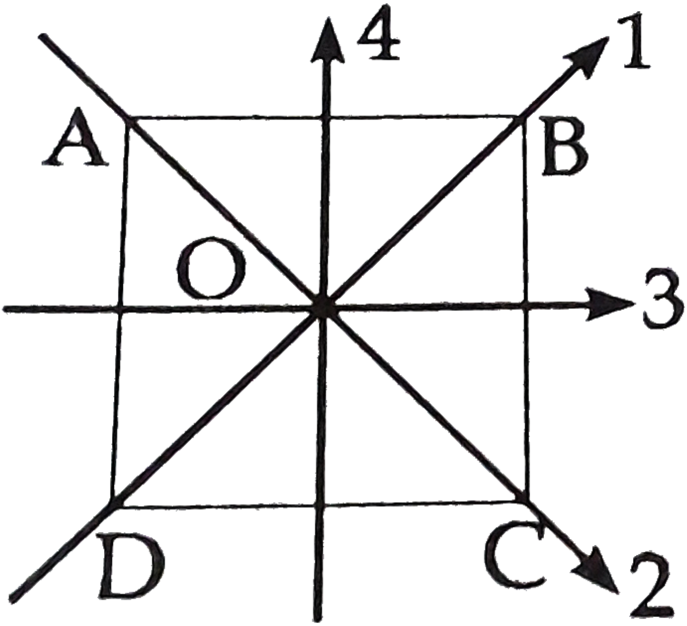
346. The moment of inertia of a thin square plate ABCD of uniform thickness about an axis passing through its center and perpendicular to its plane will



A. $I_1 + I_2$

B. $I_1 - I_3$

C. $I_1 + I_2 I_4$

D. $I_1 + I_2 + I_3$

Answer: A

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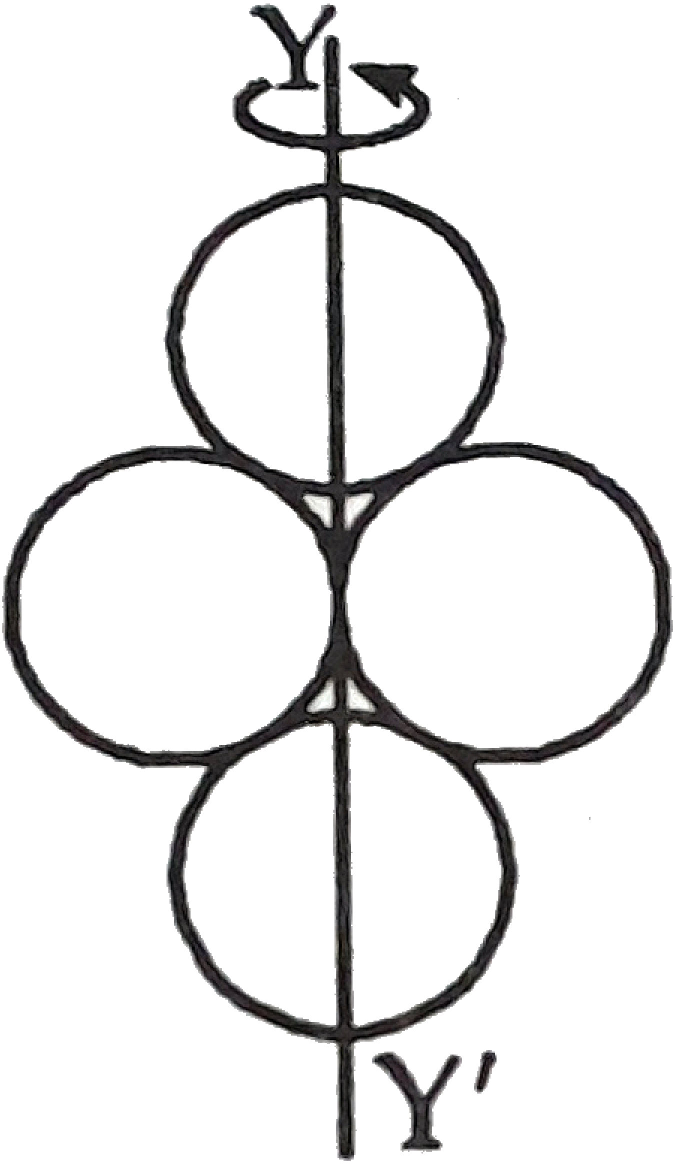
347. Four rings each of mass M and radius R are arranged as shown in the figure. The moment of inertia of the system about YY' will be



A. $3MR^2$

B. $\frac{3}{2}MR^2$

C. $4MR^2$

D. $\frac{7}{2}MR^2$

Answer: C

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348. Moment of inertia of a ring of mass m = 3 gm and radius r = 1 cm about an axis passing through its edge and parallel to its natural axis is

A. $10 gm cm^2$

B. $100 gm cm^2$

C. $6 gm cm^2$

D. $1 gm cm^2$

Answer: C

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349. A cylinder of 500 g and radius 10 cm has moment of inertia about an axis passing through its centre and parallel to its length is

A. $2.5 \times 10^{-3} kgm^2$

B. $2 \times 10^{-3} kgm^2$

C. $5 \times 10^{-3} kgm^2$

D. $3.5 \times 10^{-3} kgm^2$

Answer: A

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350. Three point masses m_1, m_2 and m_3 are located at the vertices of an equilateral triangle of side α. What is the moment of inertia of the system about an axis along the altitude of the triangle passing through m_1?

A. $(m_2 + m_3)\frac{a^2}{4}$

B. $(m_1 + m_2 + m_3)a^2$

C. $(m_1 + m_2)\frac{a^2}{4}$

D. $(m_2 + m_3)a^2$

Answer: A

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351. Three point masses each of mass m are placed at the corners of an equilateral triangle of side 'a' . Then the moment of inertia of this system about an axis passing along one side of the triangle is

A. ma^2

B. $3ma^2$

C. $\frac{3}{4}ma^2$

D. $\frac{2}{3}ma^2$

Answer: C

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352. Three rods each of length L and mass M are placed along X, Y and Z axis in such a way that one end of each of the rod is at the origin. The moment of inertia of this system about Z axis is

A. $\frac{2ML^2}{3}$

B. $\frac{4ML^2}{3}$

C. $\frac{5ML^2}{3}$

D. $\frac{ML^2}{3}$

Answer: A

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353. Two rings of 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 is (mass the ring $= m$, radius $= r$)

A. $\frac{1}{2}MR^2$

B. MR^2

C. $\frac{3}{2}MR^2$

D. $2MR^2$

Answer: C

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354. Two circular iron discs are of the same thickness. The diameter of A is twice of B . The moment of inertia of A as compared to that of B is

A. twice as large

B. four as large

C. 8 time as large

D. 16 times as large

Answer: D

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355. the flywheel is so constructed that the entire mass of it is concentrated at its rim, because

A. it increases the power

B. it increases the speed

C. it increases the moment of inertia

D. it save the flywheel fan breakage

Answer: C

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356. Four spheres of diameter 2a and mass M are placed with their centres on the four corners of a square of side b. Then moment of inertia of the system about an axis about one of the sides of the square is :-

A. $\frac{4}{5}Ma^2 + 2Mb^2$

B. $\frac{8}{5}Ma^2 + Mb^2$

C. $\frac{8}{5}Ma^2$

D. $\frac{4}{5}Ma^2 + 4Mb^2$

Answer: B

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357. Two discs have same mass and thickness. Their materials are of densities ρ_1 and ρ_2 . The ratio of their moment of inertia about central axis will be

A. $\rho_1 : \rho_2$

B. $\rho_1 \rho_2 : 1$

C. $1 : \rho_1 \rho_2$

D. $\rho_2 : \rho_1$

Answer: D

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358. A wheel has moment of inertia $5 \times 10^{-3} kgm^2$ and is making 20revs^{-1}. The torque needed to stop it in $10s$ is..... $\times 10^{-2} N - m$

A. $2\pi \times 10^{-2} Nm$

B. $2\pi \times 10^{2} Nm$

C. $4\pi \times 10^{-2} Nm$

D. $4\pi \times 10^{2} Nm$

Answer: A

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359. If all of a sudden the radius of the earth decreases, then

A. the angular momentum of the earth will become greater than that of the sun

B. the angular speed of the earth will increase

C. the periodic time earth will increase

D. the energy and angular momentum will remain constant

Answer: B

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360. The moment of inertia of a thin circular disc of mass M and radius R about any diameter is

A. $\frac{MR^2}{4}$

B. $\frac{MR^2}{2}$

C. MR^2

D. $2MR^2$

Answer: A

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361. A body of moment of inertia of $3kgm^2$ rotating with an angular velocity or 2rad//s has the same kinetic energy as a mass of 12kg moving with a velocity of

A. $1m / s$

B. $2m / s$

C. $4m / s$

D. $8m / s$

Answer: A

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362. The radius of gyration of a disc of mass 100 g and radius 5 cm about an axis pasing through centre of gravity and perpendicular to the plane is

A. 0.5cm

B. 2.5cm

C. 3.54cm

D. 6.54cm

Answer: C

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363. Two circular discs A and B have equal masses and uniform thickness but have densities ρ_1 and ρ_2 such that $\rho_1 > \rho_2$. Their moments of inertia is

A. $I_1 > I_2$

B. $I_1 > \; > I_2$

C. $I_1 < I_2$

D. $I_1 = I_2$

Answer: C

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364. If momentum of an object is increased by 10%, then is kinetic energy will increase by

A. $40\ \%$

B. $20\ \%$

C. $10\ \%$

D. $21\ \%$

Answer: D

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365. M.I. of a thin uniform rod about the axis passing through its centre and perpendicular to its length is $ML^2/12$. The rod is cut transversely into two halves, which are then riveted end to end.M.I. of the composite rod about the axis passing through its centre and perpendicular to its length will be

A. $\frac{ML^2}{3}$

B. $\frac{ML^2}{12}$

C. $\frac{ML^2}{48}$

D.

Answer: B

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366. The moment of inertia of an electron in n^{th} orbit will be

A. $MR^2 \times n$

B. $\frac{MR^2 \times n}{2}$

C. $\frac{2}{5}MR^2 \times n$

D. $\frac{2}{3}MR^2 \times n$

Answer: A

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367. The moment of inertia of uniform circular disc about an axis passing through its centre is $6kgm^2$. Its M.I. about an axis perpendicular to its plane and just touching the rim will be

A. $18kgm^2$

B. $30kgm^2$

C. $15kgm^2$

D. $3kgm^2$

Answer: A

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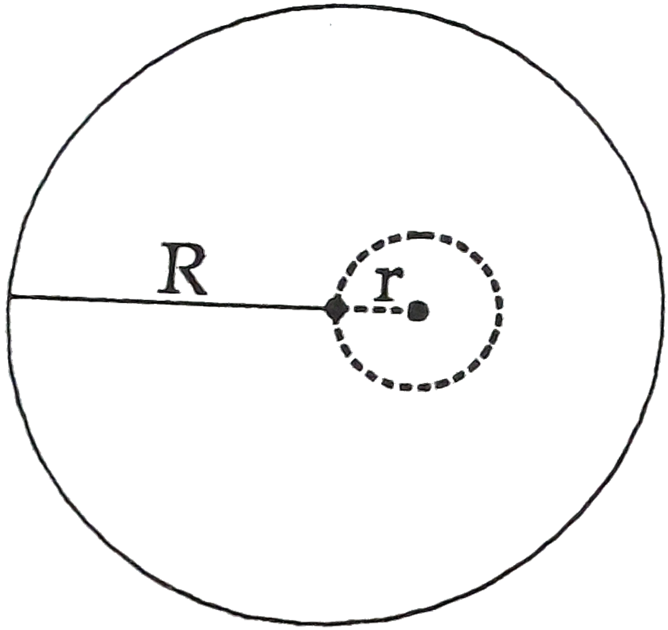
368. What will be distance of centre of mass of the disc (See fig.) from its geometrical centre ?



A. $\dfrac{R}{\left(\frac{R^2}{r^2}-1\right)}$ to left

B. $R+r,$ to left

C. $\frac{R}{R+r}$, to left

D. $\frac{R}{(r^2+R^2)}$, to left

Answer: A

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369. Moment of inertia depends on

A. distribution of particles

B. mass

C. position of axis of rotation

D. all of these

Answer: D

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370. Moment of inertia of a disc about its own axis is I. Its moment of inertia about a tangential axis in its plane is

A. $\frac{mR^2}{4}$

B. $\frac{3MR^2}{2}$

C. $\frac{5}{4}MR^2$

D. $\frac{7MR^2}{4}$

Answer: C

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371. A sphere of mass 0.5 kg and diameter 1 m rolls without sliding with a constant velocity of 5 m/s. What is the ratio of rotational KE to the total kinetic energy of the sphere ?

A. $\frac{7}{10}$

B. $\frac{5}{7}$

C. $\frac{2}{7}$

D. $\frac{1}{2}$

Answer: C

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372. Radius of gyration of disc rotating about an axis perpendicular to its plane passing through through its centre is (If R is the radius of disc)

A. $\frac{R}{2}$

B. $\frac{R}{\sqrt{2}}$

C. $\frac{R}{\sqrt{3}}$

D. $\frac{R}{3}$

Answer: B

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373. $\frac{L^2}{2I}$ represents

A. rotational kinetic energy of a particle

B. potential energy of a particle

C. torque on a particle

D. power

Answer: A

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374. A disc of moment of inertia $9.8/\pi^2 kgm^2$ is rotating at 600 rpm . If the frequency of rotation changes from 600 rpm to 300 rpm, then what is the work done?

A. 1470 J

B. 1452 J

C. 1567J

D. 1632J

Answer: A

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375. The center of mass of a system of two particles divides the distance between them.

A. inverse ratio of square of masses of particle

B. direct ratio of square of masses of particle

C. inverse ratio of masses of particle

D. direct ratio of masses of particle

Answer: C

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376. A particle moves in straight line in same direction for 20 seconds with velocity $3m/s$ and the moves with velocity $4m/s$ for another 20 sec and finally moves with velocity $5m/s$ for next 20 seconds. What is the average velocity of the particle?

A. $3m/s$

B. $4m / s$

C. $5m / s$

D. zero

Answer: B

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377. Dimensions of angular momentum is

A. $[L^1M^1T^{-2}]$

B. $[L^{-2}M^1T^{-1}]$

C. $\left[L^2M^1T^{-1}\right]$

D. $\left[L^0M^1T^{-1}\right]$

Answer: C

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378. The torque acting is 2000 Nm with an angular acceleration of $2rad/s^2$. The moment of inertia of body is

A. $1200kgm^2$

B. $900kgm^2$

C. $1000kgm^2$

D. can't say

Answer: C

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379. If radius of solid sphere is doubled by keeping its mass constant, then

A. $\frac{I_1}{I_2} = \frac{1}{4}$

B. $\frac{I_1}{I_2} = \frac{4}{1}$

C. $\frac{I_1}{I_2} = \frac{3}{2}$

D. $\frac{I_1}{I_2} = \frac{2}{3}$

Answer: A

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380. Moment of inertia of a disc about an axis which is tangent and parallel to its plane is I . Then the moment of inertia of disc about a tangent, but perpendicular to its plane will be

A. $\frac{3I}{4}$

B. $\frac{3I}{2}$

C. $\frac{5I}{6}$

D. $\frac{6I}{5}$

Answer: D

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381. By keeping moment of inertia of a body constant, if we double the time period, then angular momentum of body

A. remains constant

B. becomes half

C. doubles

D. quadruples

Answer: B

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382. Calculate the M.I. of a thin uniforn ring about an axis tangent to the ring and in a plane of the ring, if its M.I. about an axis passing through the centre and perpendicular to plane is $4kgm^2$.

A. $12kgm^2$

B. $3kgm^2$

C. $6kgm^2$

D. $9kgm^2$

Answer: C

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383. A uniform disc of mass 2kg is rotated about an axis perpendicular to the plane of the disc . If radius of gyration is 50cm, then the M.I. of disc about same axis is

A. $0.25kgm^2$

B. $0.5kgm^2$

C. $2kgm^2$

D. $1kgm^2$

Answer: B

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384. The total energy of rolling of mass 'm' and radius 'R' is

A. $3/2mv^2$

B. $1/2mv^2$

C. mv^2

D. $5/2mv^2$

Answer: C

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385. The orbital angular momentum and angular momentum (classical analogue) for the electron of 4s-orbital are respectively, equal to:

A. $\left[L^{-2}M^{1}T^{-1}\right]$

B. $\left[L^{2}M^{1}T^{-1}\right]$

C. $\left[L^{2}M^{1}T^{1}\right]$

D. $\left[L^{2}M^{2}T^{-2}\right]$

Answer: B

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386. Two disc has same mass rotates about the same axis with their densities ρ_1 and ρ_2 respectively such that $(\rho_1 > \rho_2)$, then the relation between I_1 and I_2 will be

A. $I_1 < I_2$

B. $I_1 = I_2$

C. $I_1 > I_2$

D. $I_1 = 2I_2$

Answer: A

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387. Kinetic energy of a body is 4j and its moment of inertia is $2kgm^2$, then angular momentum is

A. $2kgm^2/s$

B. $6kgm^2/s$

C. $8kgm^2/s$

D. $4kgm^2/s$

Answer: D

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388. A rod of length l, density of material D and area of cross section is A . If it rotates about its axis perpendicular to the length and passing through its centre, then its kinetic energy of rotation will be

A. $\frac{Al^3\omega^2}{12}$

B. $\frac{Al^3D.\omega^2}{24}$

C. $\dfrac{Al^3 D.\,\omega^2}{6}$

D. $\dfrac{Al^3 D.\,\omega^2}{48}$

Answer: B

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389. A body is acted upon by a constant torque . In 4 seconds its angular momentum changes from L to 4L . The magnitude of the torque is

A. $\frac{L}{4}$

B. $\frac{3L}{4}$

C. 3L

D. 12L

Answer: B

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390. Radius of gyration of a ring about a transverse axis passing through its centre is

A. $0.5 \times$ diameter of ring

B. diameter of ring

C. $2 \times$ diameter of ring

D. $(\text{diameter of ring})^2$

Answer: A

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391. Density remaining constant, if earth contracts to half of its present radius, duration of the day would be (in minutes)

A. $\frac{3}{4}$hour

B. 6 hour

C. 12hour

D. 24hour

Answer: A

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392. A moment of inertia of a thin circular plate is minimum about the following axis

A. Axis passing through its centre and perpendicular to its plane.

B. Axis along the diameter.

C. Axis along the tangent and in its own plane

D. Axis along the tangent and perpendicular to its plane.

Answer: B

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393. Moment of inertia of a solid sphere about its diameter is I . If that sphere is recast into 8 identical small spheres, then moment of inertia of such small sphere about its diameter is

A. $I / 8$

B. $I / 16$

C. $I / 24$

D. $I / 32$

Answer: D

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394. A circular disc A of radius r is made from an iron plate of thickness t and another circular disc B of radius 4r is made from an iron plate of thickness $t/4$. The relation between the moments of inertia I_A and I_B is (about an axis passing through centre and perpendicular to the disc)

A. $I_A = I_B$

B. $I_A > I_B$

C. $I_B > I_A$

D. data is insufficient

Answer: C

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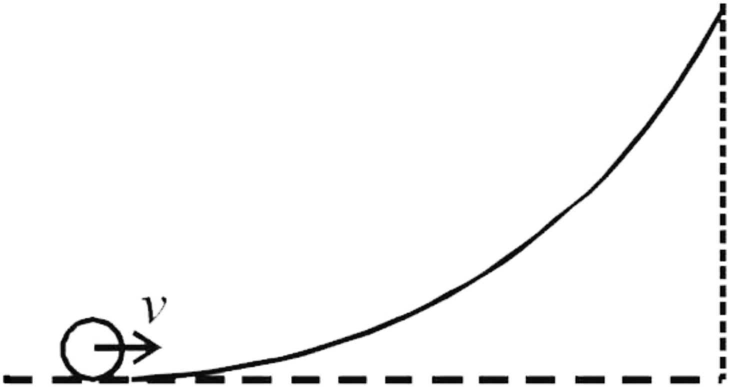
395. A small object of uniform density rolls up a curved surface with an initial velocity v. it reaches up to a maximum height of `(3v^2)/(4g)



with respect to the initial position. The object is

A. solid sphere

B. hollow sphere

C. disc

D. ring

Answer: C

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396. $\frac{L^2}{2I}$ represents

A. rotational P.E.

B. total energy

C. rotational K.E.

D. translational K.E.

Answer: C

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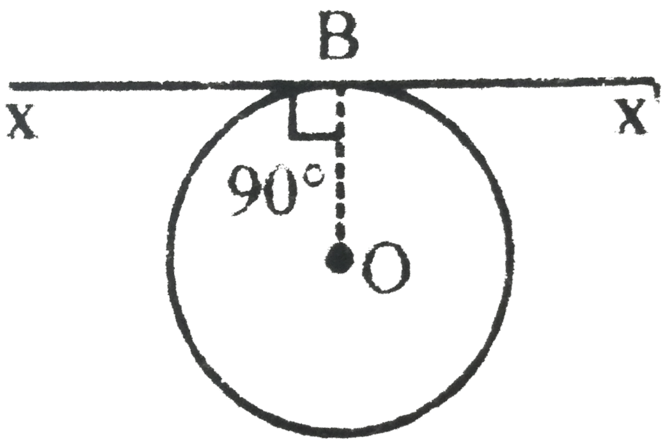
397. A thin wire of length L and uniform linear mass density ρ is bent into a circular loop with centre at O as shown. The moment of inertia of the loop about the axis XX' is :



.

A. $\frac{2\rho L^2}{8\pi^2}$

B. $\frac{8\pi^2}{3\rho L^3}$

C. $\frac{3\rho L^3}{8\pi^2}$

D. $\frac{8\pi^2}{4\rho L^2}$

Answer: C

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398. An object of radius R and mass M is rolling horizontally without slipping with speed v . It then rolls up the hill to a maximum height $h = \frac{3v^2}{4g}$. The moment of inertia of the object is (g = acceleration due to gravity)

A. $\frac{2}{5}MR^2$

B. $\frac{MR^2}{2}$

C. MR^2

D. $\frac{3}{2}MR^2$

Answer: B

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399. The moment of inertia of a uniform rod about a perpendicular axis passing through one end is I_1. The same rod is bent into a ring and its moment of inertia about a diameter is I_2. Then I_1 / I_2 is

A. $\frac{\pi}{3}$

B. $\frac{8\pi^2}{3}$

C. $\frac{5\pi}{3}$

D. $\frac{8\pi^2}{5}$

Answer: B

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400. Three identicle particle each of mass $1kg$ are placed with their centres on a straight line. Their centres are marked $A, B \text{ and } C$ respectively. The distance of centre of mass of the system from A is.

A. $\dfrac{AB + AC}{2}$

B. $\dfrac{AB + BC}{2}$

C. $\dfrac{AC - AB}{3}$

D. $\dfrac{AB + AC}{3}$

Answer: D

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401. The kinetic energy of a rotating body depends upon

A. distribution of mass only

B. angular speed only

C. distribution of mass and angular speed

D. angular acceleration only

Answer: C

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402. A solid cylinder has mass M radius R and length / its moment of inertia about an axis passing through its centre and perpendicular to its own axis is

A. $\dfrac{2MR^2}{3}+\dfrac{Ml^2}{12}$

B. $\frac{MR^2}{3} + \frac{Ml^2}{12}$

C. $\frac{3MR^2}{4} + \frac{Ml^2}{12}$

D. $\frac{MR^2}{4} + \frac{Ml^2}{12}$

Answer: D

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403. A cord is wound round the circumference of wheel of radius r. The axis of the wheel is horizontal and fixed and moment of inertia about it is I. A weight mg is attached to the end of the cord and falls from rest. After falling through a distance h, the angular velocity of the wheel will be.

A. $[mgh]^{1/2}$

B. $\left[\dfrac{2mgh}{I+2mr^2}\right]^{1/2}$

C. $\left[\dfrac{2mgh}{I+mr^2}\right]^{1/2}$

D. $\left[\dfrac{mgh}{I+mr^2}\right]^{1/2}$

Answer: C

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404. A hollow spere of mass M and radius R is rotating with angular frequency ω it suddenly stops rotating and 75% of kinetic energy is converted to heat if s is the speicific heat of the material in j / kg k then rise in temperature of the spere is (MI of hollow sphere $=\frac{2}{3}MR^2$

A. $\frac{R\omega}{4S}$

B. $\frac{R^2\omega^2}{4S}$

C. $\frac{R\omega}{2S}$

D. $\frac{R^2\omega^2}{2S}$

Answer: B

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405. A body of moment of inertia 5 kgm^2 rotating with an angular velocity 6 rad/s has the same kinetic energy as a mass of 20 kg moving with a velocity of ......

A. $5m / s$

B. $4m / s$

C. $3m / s$

D. $2m / s$

Answer: C

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