Questions

Chapter 10
Rotation

10-3 Rotation with Constant Angular Acceleration
M2-042

A wheel initially has an angular velocity of 18 rad/s but it is slowing at a constant rate of 2.0 rad/s^2. The time it takes to stop is :

A) 0. s
B) 3.0 s
C) 6.0 s
D) 12.0 s
E) 9.0 s

Answer E

10-3 Rotation with Constant Angular Acceleration
M2-041

At t=0, a disk has an angular velocity of 360 rev/min, and constant angular acceleration of -0.50 rad/s^2. How many rotations does the disk make before coming to rest?

A) 226
B) 180
C) 360
D) 90
E) 113

Answer A

10-4 Relating the Linear and Angular Variables
M2-042

Two wheels A and B are identical. Wheel B is rotating with twice the angular velocity of wheel A. The ratio of the radial acceleration of a point on the rim of B (a2) to the radial acceleration of a point on the rim of A (a1) is (a2/a1 :

A) 1/4
B) 2
C) 1/2
D) 4
E) 1

Answer D

10-5 Kinetic Energy of Rotation
M2-042

Fig 6 shows a pulley (R=3.0 cm and Io= 0.0045 kg m^2 (suspended from the ceiling. A rope passes over it with a 2.0 kg block attached to one end and a 4.0 kg block attached to the other. When the speed of the heavier block is 2.0 m/s the total kinetic energy of the pulley and blocks is :

A) 2 J
B) 10 J
C) 22 J
D) 16 J
E) 38 J

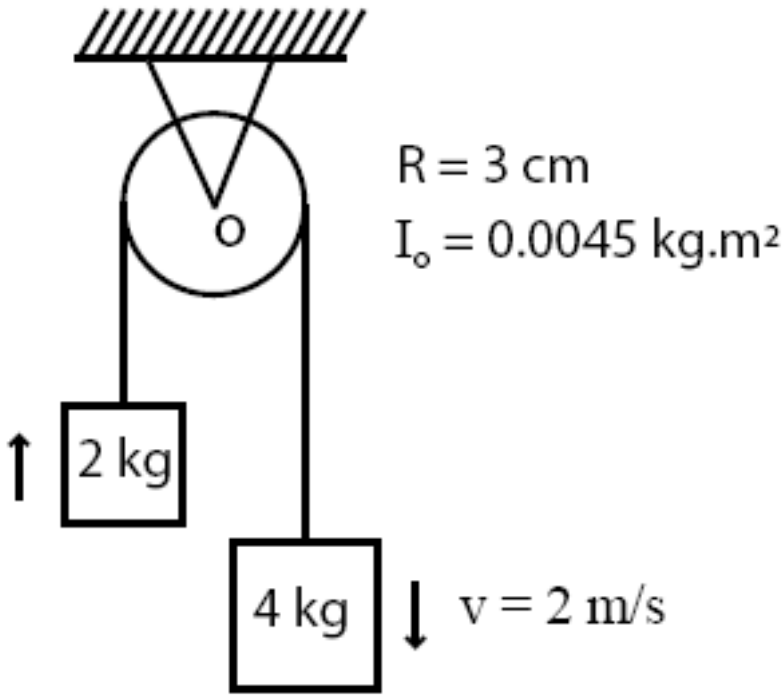


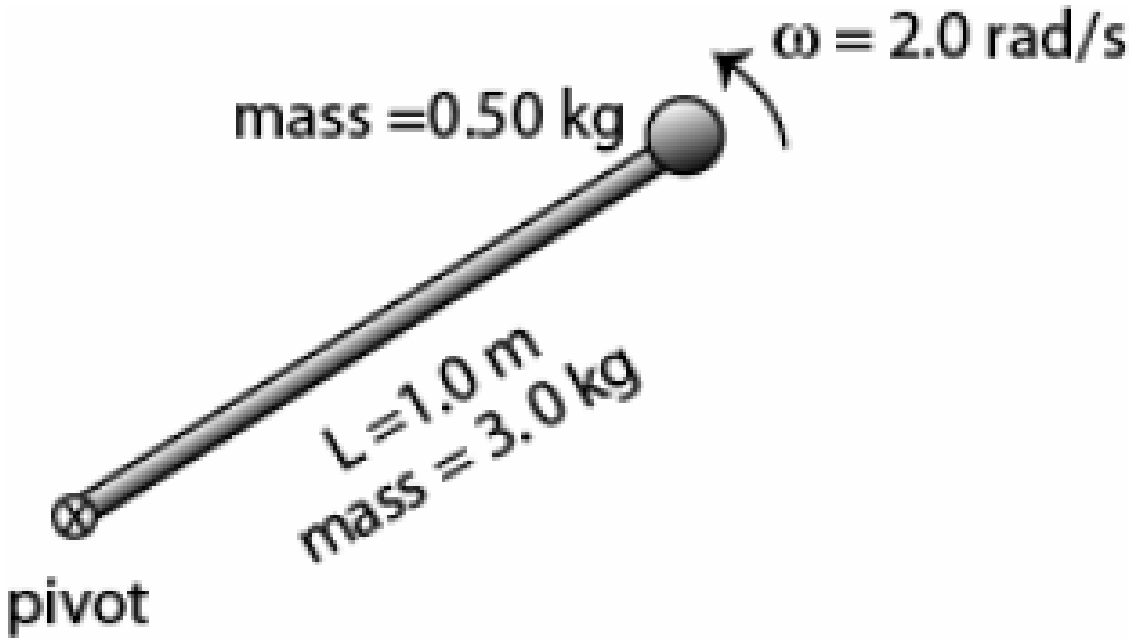
Figure 6

Answer C

10-6 Calculating the Rotational Inertia
M2-061

A particle of mass 0.50 kg is attached to one end of a 1.0 m long rod of mass 3.0 kg (Fig 5). The rod and the particle are rotating around the other pivoted end of the rod with 2.0 rad/s. The kinetic energy of the system about the pivot is:

A) 0.50 J
B) 0.84 J
C) 3.0 J
D) 0.62 J
E) 1.0 J



Answer C

10-6 Calculating the Rotational Inertia
M2-042

Four identical particles, each with mass m, are arranged in the x, y plane as shown in Fig 5. They are connected by light sticks of negligible mass to form a rigid body. If m = 2.0 kg and a = 1.0 m, the rotational inertia of this system about the y-axis is:

A) 12 kg m^2
B) 4.0 kg m^2
C) 8.0 kg m^2
D) 16 kg m^2
E) 0 kg m^2

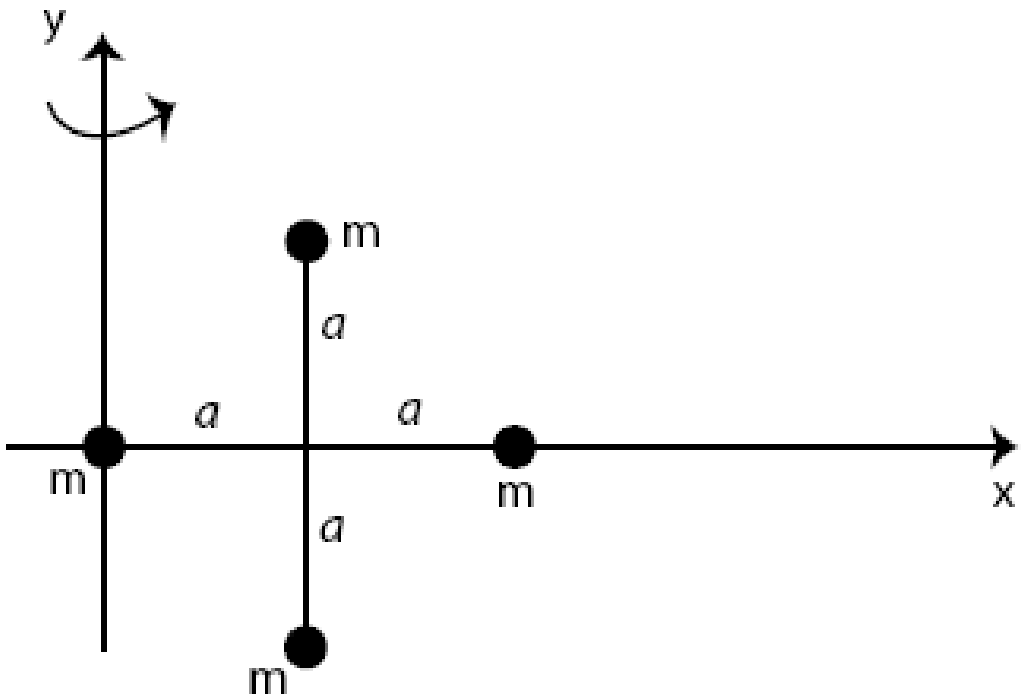


Figure 5

Answer A

10-7 Torque
M2-061

What is the net torque about the origin on an object located at (0, -5.0, 5.0) m when forces $\mathbf{F}_1$ = (-3.0 **k**) N and $\mathbf{F}_2$ = (2.0 **j**) N act on the object?

A) (15 **i**) N m
B) (5.0 **i**) N m
C) (10 **j**) N m
D) (-3.0 **k** + 2.0 **j**) N m
E) Zero

Answer B

10-7 Torque
M2-061

A 2.0 kg particle is moving such that its position vector (r) relative to the origin is $\mathbf{r} = (-2.0\ t^2\ \mathbf{i} + 3.0\ \mathbf{j})$ m. What is the torque (about the origin) acting on the particle at t=2.0 s?

A) -24 **k** N.m
B) -36 **k** N.m
C) 24 **k** N.m
D) -48 **k** N.m
E) 0

Answer C

10-8 Newton's Second Law for Rotation
M2-062

A torque of 0.80 N·m applied to a pulley increases its angular speed from 45.0 rev/min to 180 rev/min in 3.00 s. Find the moment of inertia of the pulley.

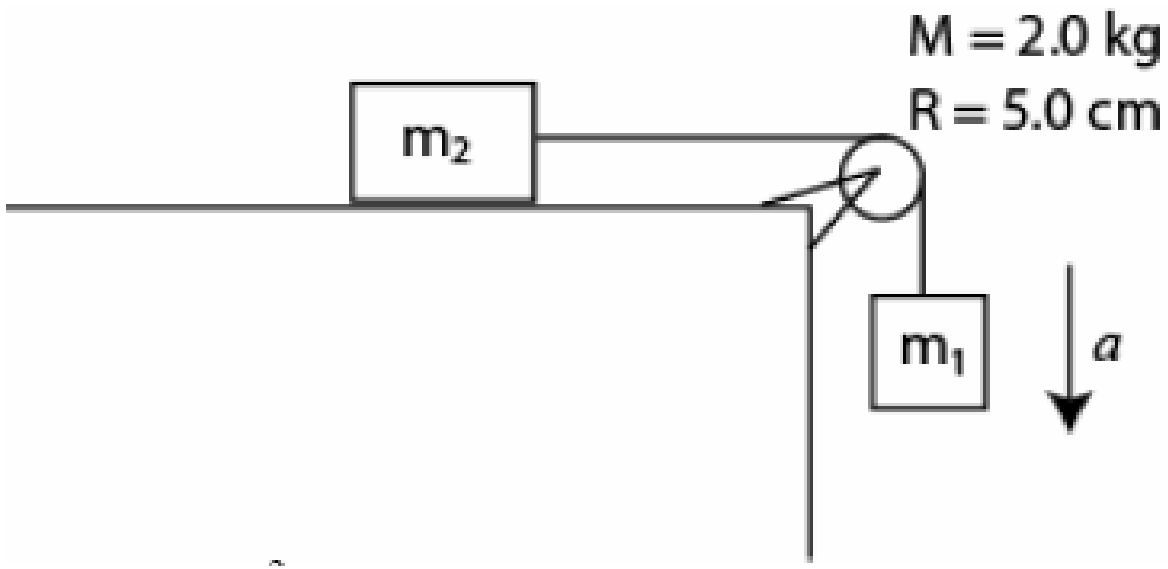
A) 0.54 $kg \cdot m^2$
B) 0.21 $kg \cdot m^2$
C) 0.17 $kg \cdot m^2$
D) 0.42 $kg \cdot m^2$
E) 0.30 $kg \cdot m^2$

Answer C

10-8 Newton's Second Law for Rotation
M2-062

A mass, m_1 = 5.0 *kg*, hangs from a string and descends with an acceleration = *a*. The other end is attached to a mass m_2 = 4.0 *kg* which slides on a frictionless horizontal table. The string goes over a pulley (a uniform disk) of mass *M* = 2.0 *kg* and radius *R* = 5.0 *cm* (see Fig. 6). The value of *a* is:

A) 1.0 m/s^2
B) 5.4 m/s^2
C) 9.8 m/s^2
D) 2.0 m/s^2
E) 4.9 m/s^2



Answer E

10-8 Newton's Second Law for Rotation
M2-062

A thin rod of mass 0.23 kg and length 1.00 m is rotated in a horizontal circle about a fixed axis passing through a point 20.0 cm from one of the edges of the rod. If it has a constant angular acceleration of 3.0 rad/s^2, find the net torque acting on the rod?

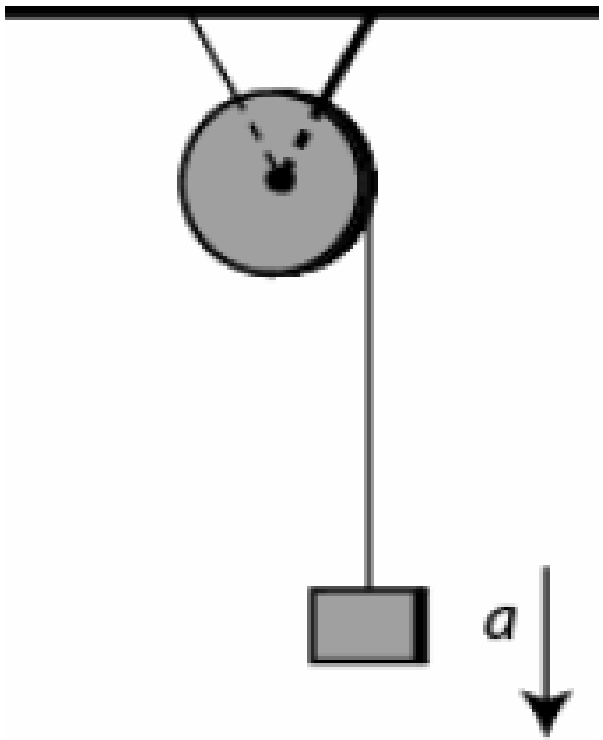
A) 0.12 N·m
B) 0.085 N·m
C) 0.028 N·m
D) 0.15 N·m
E) 0.077 N·m

Answer A

10-8 Newton's Second Law for Rotation
M2-061

A 16 kg block is attached to a cord that is wound around the rim of a flywheel of radius 0.20 m and hangs vertically, as shown in Fig 4. The rotational inertia of the flywheel is 0.50 kg·m^2. When the block is released and the cord unwinds, the acceleration of the block is:

A) 9.8 m/s^2
B) 1.5 m/s^2
C) 8.2 m/s^2
D) 5.5 m/s^2
E) 13 m/s^2



Answer D

10-8 Newton's Second Law for Rotation
M2-061

A disk starts from rest and rotates around a fixed axis, subject to a constant net torque. The work done by the torque during the time interval from t = 0 to 2 s is W1 and the work done during the time interval from t = 0 to 6 s is W2. The ratio W2/W1 =

A) 9
B) 3
C) 1 / 3
D) 1 / 9
E) 4

Answer A

10-8 Newton's Second Law for Rotation
M2-041

In Fig 6, m_1 = 0.50 kg, m_2 = 0.40 kg and the pulley has a disk shape of radius 0.05 m and mass M = 1.5 kg. What is the linear acceleration of the block of mass m_2?

A) 0.59 m/s^2
B) 0.42 m/s^2
C) 1.46 m/s^2
D) 0.21 m/s^2
E) 0.0

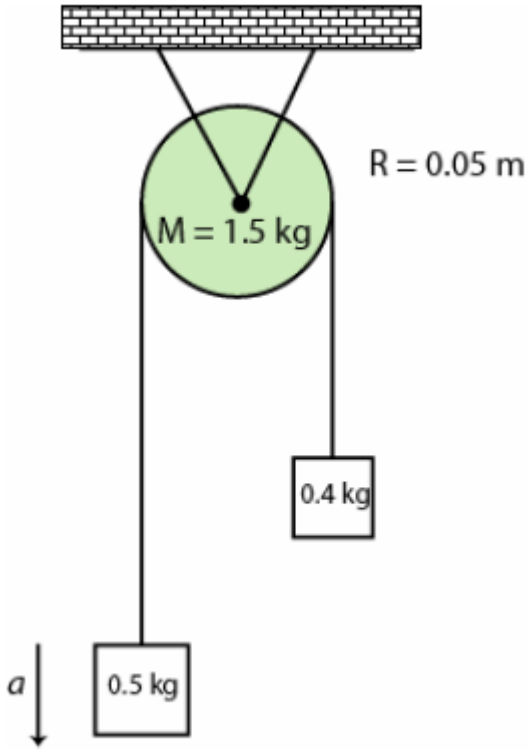


Figure 6

Answer A

10-9 Work and Rotational Kinetic Energy
M2-062

A disk has a rotational inertia of 4.0 kg·m^2 and a constant angular acceleration of 2.0 rad/s^2. If it starts from rest the work done during the first 5.0 s by the net torque acting on it is:

A) 0 J
B) 100 J
C) 40 J
D) 200 J
E) 400 J

Answer D

10-9 Work and Rotational Kinetic Energy
M2-062

A disk starts from rest at $t = 0$, and rotates about a fixed axis (moment of inertia = 0.030 $kg \cdot m^2$) with an angular acceleration of 7.5 rad/s^2. What is the rate at which work is being done on the disk when its angular velocity is 32 rad/s?

A) 5.5 *W*
B) 7.2 *W*
C) 3.1 *W*
D) 8.7 *W*
E) 2.2 *W*

Answer B

10-9 Work and Rotational Kinetic Energy
M2-062

The engine delivers 1.20×10^5 W to a plane propeller at ω = 2400 rev/min. How much work does the engine do in one revolution?

A) 3000 J
B) 4000 J
C) 5000 J
D) 2000 J
E) 1000 J

Answer A

10-9 Work and Rotational Kinetic Energy
M2-041

A uniform rod (M = 2.0 kg, L = 2.0 m) is held vertical about a pivot at point P, a distance L/4 from one end (see Fig 7). The rotational inertia of the rod about P is 1.17 kg m^2. If it starts rotating from rest, what is the linear speed of the lowest point of the rod as it passes again through the vertical position (v)?

A) 2.4 m/s
B) 4.8 m/s
C) 17 m/s
D) 8.7 m/s
E) zero

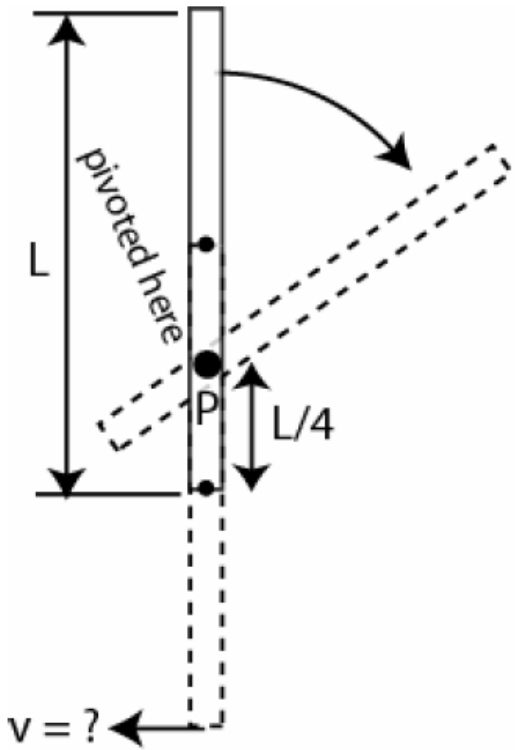


Figure 7

Answer D