بسم الله الرحمن الرحيم

KING SAUD UNIVERSITY

PHYSICS & ASTRONOMY DEPARTMENT

103 Phys – Dr. Abdallah M. Azzeer

First Term 1426/1427 H

MCQ on CHAPTER 10

WRITE THE CORRECT ANSWER ON THE ATTACHED SHEET

1. At t = 0, a wheel rotating about a fixed axis at a constant angular acceleration has an angular velocity of 2.0 rad/s. Two seconds later it has turned through 5.0 complete revolutions. What is the angular acceleration of this wheel?

(a) 17 rad/s^2 **(b)** 14 rad/s^2 **(c)** 20 rad/s^2 **(d)** 23 rad/s^2 **(e)** 13 rad/s^2

2. A wheel rotating about a fixed axis has an angular position given by $\theta = 3.0 - 2.0t^3$, where θ is measured in radians and t in seconds. What is the angular acceleration of the wheel at t = 2.0 s?

(a) –1.0 rad/s^2 **(b)** –24 rad/s^2 **(c)** –2.0 rad/s^2 **(d)** –4.0 rad/s^2 **(e)** –3.5 rad/s^2

3. The turntable of a record player has an angular velocity of 8.0 rad/s when it is turned off. The turntable comes to rest 2.5 s after being turned off. Through how many radians does the turntable rotate after being turned off? Assume constant angular acceleration.

(a) 12 rad **(b)** 8.0 rad **(c)** 10 rad **(d)** 16 rad **(e)** 6.8 rad

4. A thin uniform rod (length = 1.2 m, mass = 2.0 kg) is pivoted about a horizontal, frictionless pin through one end of the rod. (The moment of inertia of the rod about this axis is $ML^2/3$.) The rod is released when it makes an angle of 37° with the horizontal. What is the angular acceleration of the rod at the instant it is released?

(a) 9.8 rad/s^2 **(b)** 7.4 rad/s^2 **(c)** 8.4 rad/s^2 **(d)** 5.9 rad/s^2 **(e)** 6.5 rad/s^2

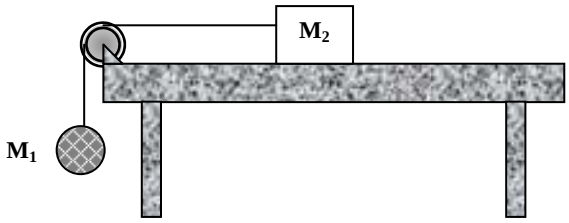
5. A wheel rotates about a fixed axis with a constant angular acceleration of 4.0 rad/s^2. The diameter of the wheel is 40 cm. What is the linear speed of a point on the rim of this wheel at an instant when that point has a total linear acceleration with a magnitude of 1.2 m/s^2?

(a) 39 cm/s **(b)** 42 cm/s **(c)** 45 cm/s **(d)** 35 cm/s **(e)** 53 cm/s

6. A disk (radius = 8.0 cm) that rotates about a fixed axis starts from rest and accelerates at a constant rate to an angular velocity of 4.0 rad/s in 2.0 s. What is the magnitude of the total linear acceleration of a point on the rim of the disk at the instant when the angular velocity of the disk is 1.5 rad/s?

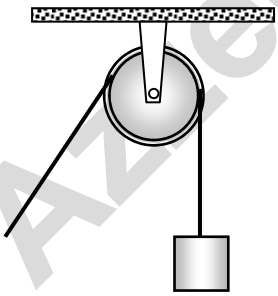
(a) 24 cm/s^2 **(b)** 16 cm/s^2 **(c)** 18 cm/s^2 **(d)** 34 cm/s^2 **(e)** 44 cm/s^2

7. A mass (M_1 = 5.0 kg) is connected by a light cord to a mass (M_2 = 4.0 kg) which slides on a smooth surface, as shown in the figure. The pulley (radius = 0.20 m) rotates about a frictionless axle. The acceleration of M_2 is 3.5 m/s^2. What is the moment of inertia of the pulley?



(a) 0.29 kg · m^2
(b) 0.42 kg · m^2
(c) 0.20 kg · m^2
(d) 0.62 kg · m^2
(e) 0.60 kg · m^2

8. A wheel (radius = 0.20 m) is mounted on a frictionless, horizontal axis. A light cord wrapped around the wheel supports a 0.50-kg object, as shown in the figure. When released from rest the object falls with a downward acceleration of 5.0 m/s^2. What is the moment of inertia of the wheel?



(a) 0.023 kg · m^2
(b) 0.027 kg · m^2
(c) 0.016 kg · m^2
(d) 0.019 kg · m^2
(e) 0.032 kg · m^2

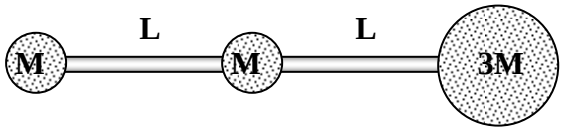
9. Two particles (m_1 = 0.20 kg, m_2 = 0.30 kg) are positioned at the ends of a 2.0-m long rod of negligible mass. What is the moment of inertia of this rigid body about an axis perpendicular to the rod and through the center of mass?

(a) 0.48 kg · m^2 **(b)** 0.50 kg · m^2 **(c)** 1.2 kg · m^2 **(d)** 0.80 kg · m^2 **(e)** 0.70 kg · m^2

10. Four identical particles (mass of each = 0.40 kg) are placed at the vertices of a rectangle (2.5 m × 4.0 m) and held in those positions by four light rods which form the sides of the rectangle. What is the moment of inertia of this rigid body about an axis that passes through the mid-points of the shorter sides and is parallel to the longer sides?

(a) 2.2 kg · m^2 **(b)** 2.8 kg · m^2 **(c)** 2.5 kg · m^2 **(d)** 3.1 kg · m^2 **(e)** 1.6 kg · m^2

11. If M = 0.50 kg, L = 1.2 m, and the mass of each connecting rod shown is negligible, what is the moment of inertia about an axis perpendicular to the paper through the center of mass? Treat the mass as particles.



(a) 3.7 kg · m^2 **(b)** 2.8 kg · m^2 **(c)** 3.2 kg · m^2 **(d)** 2.3 kg · m^2 **(e)** 3.9 kg · m^2

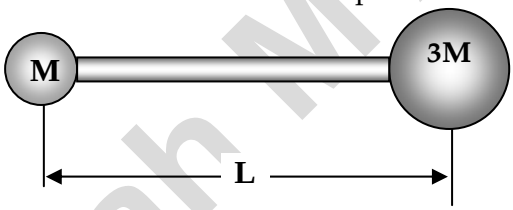
12. A uniform rod is 2.0 m long. The rod is pivoted about a horizontal, frictionless pin through one end. The rod is released from rest at the horizontal position. What is the angular acceleration of the rod at the instant the rod makes an angle of 70° with the horizontal?

(a) 3.7 rad/s^2 **(b)** 1.3 rad/s^2 **(c)** 2.5 rad/s^2 **(d)** 4.9 rad/s^2 **(e)** 1.9 rad/s^2

13. A uniform rod of mass M = 1.2 kg and length L = 0.80 m, lying on a frictionless horizontal plane, is free to pivot about a vertical axis through one end, as shown. The moment of inertia of the rod about this axis is given by ML^2. If a force (F = 5.0 N, θ = 40°) acts as shown, what is the resulting angular acceleration about the pivot point?

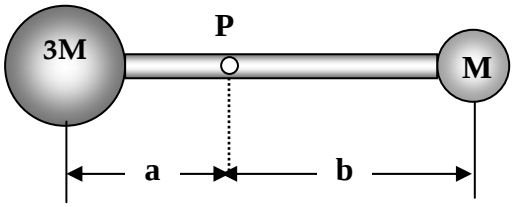
(a) 16 rad/s^2
(b) 12 rad/s^2
(c) 14 rad/s^2
(d) 10 rad/s^2
(e) 33 rad/s^2

14. The rigid body shown rotates about an axis through its center of mass and perpendicular to the paper. If M = 2.0 kg and L = 80 cm, what is the kinetic energy of this object when its angular speed about this axis is equal to 5.0 rad/s? Neglect the mass of the connecting rod and treat the masses as particles.



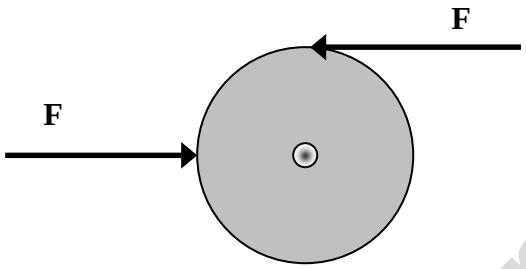
(a) 18 J **(b)** 15 J **(c)** 12 J **(d)** 23 J **(e)** 26 J

15. The rigid body shown is rotated about an axis perpendicular to the paper and through the point P. If M = 0.40 kg, a = 30 cm, and b = 50 cm, how much work is required to take the body from rest to an angular speed of 5.0 rad/s? Neglect the mass of the connecting rods and treat the masses as particles.



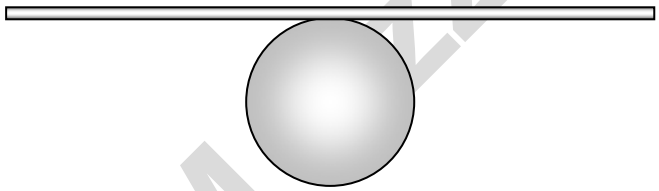
(a) 2.9 J **(b)** 2.6 J **(c)** 3.1 J **(d)** 3.4 J **(e)** 1.6 J

16. Two forces of magnitude 50 N, as shown in the figure below, act on a cylinder of radius 4 m and mass 6.25 kg. The cylinder, which is initially at rest, sits on a frictionless surface. After 1 second, the velocity and angular velocity of the cylinder in m/s and rad/s are respectively



(a) $v = 0;\ \omega = 0.$
(b) $v = 0;\ \omega = 4.$
(c) $v = 0;\ \omega = 8.$
(d) $v = 8;\ \omega = 8.$
(e) $v = 16;\ \omega = 8.$

17. A uniform sphere of radius R and mass M rotates freely about a horizontal axis that is tangent to an equatorial plane of the sphere, as shown below. The moment of inertia of the sphere about this axis is



(a) $\frac{2}{5}MR^2$.
(b) $\frac{2}{3}MR^2$.
(c) $\frac{5}{7}MR^2$.
(d) $\frac{7}{5}MR^2$.
(e) $\frac{3}{2}MR^2$.

18. The angular speed of the hour hand of a clock, in rad/min, is

(a) $\frac{1}{1800}\pi$. **(b)** $\frac{1}{60}\pi$. **(c)** $\frac{1}{30}\pi$. **(d)** π. **(e)** 120π.

The more problems you do, the more chance to get A+

تمنياتي للجميع التوفيق والنجاح

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ANSWER SHEET* FOR MCQ- *CHAPTER 10

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