Name: Class: Date: _____ ID: A

Physics - Rotational Motion

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

D 1. A helicopter has 3.0 m long rotor blades that are rotating at an angular speed of 63 rad/s. What is the tangential speed of each blade tip?
   a. 99 m/s
   b. 21 m/s
   c. 66 m/s
   d. 190 m/s

A 2. The gravitational force between two masses is 36 N. What is the gravitational force if the distance between them is tripled? ($G = 6.673 \times 10^{-11}$ N•m^2/kg^2)
   a. 4.0 N
   b. 9.0 N
   c. 27 N
   d. 18 N

A 3. A cave dweller rotates a pebble in a sling with a radius of 0.30 m counterclockwise through an arc length of 0.96 m. What is the angular displacement of the pebble?
   a. 3.2 rad
   b. –1.6 rad
   c. 1.6 rad
   d. –3.2 rad

C 4. A wheel with a radius of 1.2 m rotates at a constant angular speed of 10.5 rad/s. What is the tangential speed of a point 0.55 m from the wheel's axis?
   a. 13 m/s
   b. 19 m/s
   c. 5.8 m/s
   d. 8.7 m/s

A 5. A contestant in a game show spins a stationary wheel with a radius of 0.50 m so that it has a constant angular acceleration of 0.40 rad/s^2. What is the tangential acceleration of a point on the edge of the wheel?
   a. 0.20 m/s^2
   b. 0.60 m/s^2
   c. 0.73 m/s^2
   d. 1.3 m/s^2

D 6. What is the gravitational force between two trucks, each with a mass of 2.0×10^4 kg, that are 2.0 m apart? ($G = 6.673 \times 10^{-11}$ N•m^2/kg^2)
   a. 1.2×10^{-7} N
   b. 5.7×10^{-2} N
   c. 1.3×10^{-2} N
   d. 6.7×10^{-3} N

C 7. A Ferris wheel rotates with an initial angular speed of 0.50 rad/s and accelerates over a 7.00 s interval at a rate of 4.0×10^{-2} rad/s^2. What is its angular speed?
   a. 0.20 rad/s
   b. 0.46 rad/s
   c. 0.78 rad/s
   d. 0.30 rad/s

A 8. A lapidary plate at rest is turned on to cut a gemstone. The plate rotates until it reaches an angular speed of 12.0 rad/s in 4.0 s. What is the centripetal acceleration of a point 0.10 m from the center of the plate?
   a. 14 m/s^2
   b. 29 m/s^2
   c. 7.2 m/s^2
   d. 0.45 m/s^2

C 9. A child sits on a carousel at a distance of 3.5 m from the center and rotates through an arc length of 6.5 m. What is the angular displacement of the child?
   a. 5.0 rad
   b. 3.0 rad
   c. 1.9 rad
   d. 0.93 rad

B 10. A 0.40 kg ball on a 0.50 m string rotates in a circular path in a vertical plane. If the angular speed of the ball at the bottom of the circle is 8.0 rad/s, what is the force that maintains circular motion?
   a. 5.6 N
   b. 13 N
   c. 11 N
   d. 20.0 N

A 11. A bucket on the circumference of a water wheel travels an arc length of 18 m. If the radius of the wheel is 4.1 m, what is the angular displacement of the bucket?

a. 4.4 rad
b. 1.0 rad
c. 2.3 rad
d. 3.7 rad

C 12. An automobile tire with a radius of 0.30 m starts at rest and accelerates at a constant angular acceleration of 2.0 rad/s² for 5.0 s. What is the angular displacement of the tire?

$\Delta\theta = \omega_i \Delta t + \frac{1}{2}\alpha t^2$

$\Delta\theta = 0 + \frac{1}{2}(2)(5)^2$

a. 12 rad
b. 2.0 rad
c. 25 rad
d. 0.50 rad

A 13. A 80.0 kg passenger is seated 12 m from the center of the loop of a roller coaster. What centripetal force does the passenger experience when the roller coaster reaches an angular speed of 3.14 rad/s?

a. 9.5×10^3 N
b. 7.2×10^3 N
c. 6.9×10^3 N
d. 1.7×10^3 N

B 14. A point on the rim of a rotating wheel with a 0.37 m radius has a centripetal acceleration of 19.0 m/s². What is the angular speed of the wheel?

a. 1.6 rad/s
b. 7.2 rad/s
c. 0.89 m/s
d. 3.2 rad/s

D 15. Which of the following angles equals 2π rad?

a. 180°
b. 3.14°
c. 0°
d. 360°

D 16. One radian is equal to

a. 58°.
b. 56°.
c. 60°.
d. 57.3°.

C 17. A potter's wheel moves from rest to an angular speed of 0.54 rad/s in 30.0 s. What is the angular acceleration of the wheel?

a. 0.042 rad/s²
b. 1.3 rad/s²
c. 0.018 rad/s²
d. 16 rad/s²

A 18. An automobile tire with a radius of 0.3 m accelerates from rest at a constant 2 rad/s² over a 5 s interval. What is the tangential component of acceleration for a point on the outer edge of the tire?

a. 0.6 m/s²
b. 7 m/s²
c. 30 m/s²
d. 0.3 m/s²