1. A 3.0-kg ball with an initial velocity of (4**i** + 3**j**) m/s collides with a wall and rebounds with a velocity of (–4**i** + 3**j**) m/s. What is the impulse exerted on the ball by the wall?

A) +24**i** N s
B) –24**i** N s
C) +18**j** N s
D) –18**j** N s
E) +8.0**i** N s

2. An 80-g particle moving with an initial speed of 50 m/s in the positive *x* direction strikes and sticks to a 60-g particle moving 50 m/s in the positive *y* direction. What is the magnitude of the velocity of the composite system after the collision?

A) 36 m/s
B) 50 m/s
C) 75 m/s
D) 86 m/s
E) 11 m/s

3. A merry-go-round rotates from rest with an angular acceleration of 1.56 rad/s^2. How long does it take to rotate through the first 2 rev?

A) 2 s
B) 4 s
C) 6 s
D) 8 s
E) 10 s

4. A wheel, with radius R = 0.5 m, initially has an angular velocity of 2.5 rev/s, and is slowing down at a rate of 2 rad/s^2. By the time it stops spinning about its center, what distance will a point on the outer rim have traveled?

A) 12 m
B) 18 m
C) 24 m
D) 31 m
E) 47 m

5. A uniform cylinder of radius *R*, mass *M* , and length *L* rotates freely about a horizontal axis parallel and tangent tothe cylinder, as shown below. The moment of inertia of the cylinder about this axis is

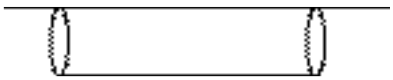
A) $\frac{1}{2}MR^2$.

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

C) MR^2

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

E) $\frac{7}{5}MR^2$.



6. A turbine blade rotates with angular velocity $\omega(t) = 2.00\,rad/s - (2.1 rad/s^3)t^2$. What is the angular acceleration of the blade at t=9.10 s?

A) 23 rad/s^2
B) 45 rad/s^2
C) **-38.2 rad/s^2**
D) -45 rad/s^2
E) 34 rad/s^2

7. A 2-kg object moving to the right with velocity 5 m/s collides with a 3-kg object which is initially at rest. After the collision, the 3-kg object has a velocity vector $\boldsymbol{v} = \boldsymbol{i} - \boldsymbol{j}$. What is the speed of the 2-kg object after the collision?

A) 0.8 m/s
B) 1.8 m/s
C) 2.8 m/s
D) 3.8 m/s
E) 4.8 m/s

8. A 620-g object traveling at 2.1 m/s collides head-on with a 320-g object traveling in the opposite direction at 3.8 m/s. If the collision is perfectly elastic, what is the change in the kinetic energy of the 620-g object?

A) 3.43 J
B) 5.34 J
C) 7.85 J
D) 2.32 J
E) 0.23 J

9. A toy car is on a small indoor track, which is 100-m in circumference. The car starts from rest, accelerates uniformly, and after 5 seconds reaches a point halfway around the circle. At this time, what is the magnitude of the car's acceleration?

A) 4 m/s
B) 9 m/s
C) 16 m/s
D) 25 m/s
E) >25 m/s

10. A 4-kg ball moving to the right at 12 m/s collides elastically with a 2-kg ball moving to the left at 6 m/s. What are the speeds of the 4-kg and the 2-kg balls after the collision?

A) 4 m/s and 10 m/s
B) 6 m/s and 12 m/s
C) 12 m/s and 6 m/s
D) 8 m/s and -8 m/s
E) 10 m/s and -4 m/s

12. A 2-kg block is placed at the top of a 5-m high, frictionless ramp and is released from rest. At the bottom of the ramp the 2-kg block collides with a 1-kg block that is initially at rest. The blocks stick together. What is the velocity of the blocks after the collision?

A) 3.3 m/s
B) 6.6 m/s
C) 9.9 m/s
D) 10.10 m/s
E) There is not enough information given

13. You want to double the radius of a rotating solid sphere while keeping its kinetic energy constant. (The mass does not change.) To do this, the final angular velocity of the sphere must be

A) four times its initial value
B) twice its initial value.
C) the same as its initial value.
D) half of its initial value.
E) one-quarter of its initial value.

14. A 0.160 kg hockey puck is moving on an icy, frictionless, horizontal surface. At $t = 0$, the puck is moving to the right at 3.00 m/s. Calculate the velocity of the puck (magnitude and direction) after a force of 25.0 N directed to the right has been applied for 0.050 s.

A) 8.0 m/s (to the left)
B) -9.2 m/s (to the left)
C) -10.0 m/s (to the left)
D) +10.8 m/s (to the right)
E) + 9.2 m/s (to the right)

15. A disk with radius R= 17 m. is spinning about its center. Initially the disc has an angular velocity of 72 rad/sec, and is slowing down uniformly at a rate of 2.0 rad/s^2. By the time it stops spinning, the total number of revolutions the disk will make is:

A) 226
B) 124
C) 100
D) 95
E) 67

16. Four small spheres, each of which you can regard as a point of mass 0.200 kg, are arranged in a square 0.400 m on a side and connected by extremely light rods as it is shown in the figure. Find the moment of inertia in $kg \cdot m^2$ of the system about an axis through the center of the square, perpendicular to its plane (an axis through point *O* in the figure);

A) 0.064
B) 1.823
C) 2.992
D) 5.781
E) 6.231