1) A 2.00-kg object begins at rest and is acted on by a force that does 300 J of work on the object. What is the final momentum of the object?
A) 150 kg·m/s B) 87.5 kg·m/s C) 75.0 kg·m/s D) 34.6 kg·m/s E) 55.0 kg·m/s

2) What is the momentum of a 1200-lb car traveling at 10.0 mph?
A) 2.43E3 kg·m/s B) 3.65E3 kg·m/s C) 12.0E3 kg·m/s D) 6.08E3 kg·m/sE) 4.86E3 kg·m/s

3) A 1000-kg car is traveling at 20.0 m/s toward the north. During a collision the car receives an impulse of 1.00 × 104 N·s toward the south. What is the velocity of the car after the impulse is applied to the car?
A) 0.00 m/s B) 20.0 m/s north C) 30.0 m/s north D) 10.0 m/s north E) -10.0 m/s south

4) During a collision with a wall, the velocity of a 0.200-kg ball changes from 20.0 m/s toward the wall to 12.0 m/s away from the wall. If the time the ball was in contact with the wall was 20.0 ms, what was the magnitude of the average force applied to the ball?
A) 80.0 N B) 26.7 N C) 320 N D) 20.0 N E) 40.0 N

5) Two objects of the same mass move along the same line in opposite directions. The first mass is moving with speed *v*. The objects collide in a perfectly inelastic collision and move with speed 0.400*v* in the direction of the velocity of the first mass before the collision. What was the speed of the second mass before the collision?
A) 0.200*v* B) 2.00*v* C) 1.800*v* D) 0.600*v* E) 0.00*v*

6) A 2.00-m rod of negligible mass connects two small objects. The mass of one object is 1.00 kg and the mass of the other is unknown. The center of mass of this system is on the rod a distance 1.60 m from the 1.00-kg mass object. What is the mass of the other object?
A) 0.800 kg B) 4.11 kg C) 0.250 kg D) 3.22 kg E) 4.00 kg

7) A rigid body is rotating about a fixed axis through the origin. The angular velocity is $\omega k\,\hat{}$, where ω is positive. What is the unit vector in the direction of the velocity of a point on the body located on the positive *y* axis?
A) $j\,\hat{}$ B) $-j\,\hat{}$ C) $i\,\hat{}$ D) $\hat{}-I$ E) not enough information

8) A massless rod of length 1.00 m has a 2.00-kg mass attached to one end and a 3.00-kg mass attached to the other. The system rotates about a fixed axis perpendicular to the rod that passes

through the rod 30.0 cm from the end with the 3.00-kg mass attached. What is the moment of inertia of this system about this axis?
A) 0.980 kg·m2 B) 2.30 kg·m2 C) 0.270 kg·m2 D) 1.25 kg·m2 E) 2.00 kg·m2

9) A force of $\vec{F}$ = 3.00 N$\hat{i}$ + -2.00 N$\hat{j}$ acts at a location $\vec{r}$ = 1.00 N$\hat{i}$ + 2.00 N$\hat{j}$ on an object. What is the torque that this force applies about an axis through the origin perpendicular to the *xy* plane?
A) 8.00 N·m $\hat{k}$ B) 7.00 N·m $\hat{k}$ C) -1.00 N·m $\hat{k}$ D) 5.00 N·m $\hat{k}$ E) 3.00 N·m $\hat{k}$

10) The space station stabilizer rockets are malfunctioning, but the space station rotation rate must be slowed down before a supply ship can dock with it. Which of the following actions of the astronauts would slow the rotation rate of the space station?
A) Move as much mass as far as possible away from the axis of rotation of the space station.
B) Start a massive flywheel spinning in a direction opposite to the direction of rotation of the space station.
C) Move as much mass as close as possible toward the axis of rotation of the space station.
D) Run around the inside of the space station in a direction opposite to the rotation of the space station.
E) answers A, C, and D

11) In an effort to loosen the bolt on the wheel of a car, a man with a mass of 70 kg steps on the end of a 50-cm tire iron which is extending horizontally from the bolt. How much torque is he applying to the bolt? A) 343 N m B) 35 N m C) 140 N m D) 70 N m E) 14 N m

12) A uniform circular disk rolls on its edge without slipping. What is the ratio of its rotational kinetic energy to its translational kinetic energy? A) ½ B) 1 C) 1/3 D) ¼ E) 4/3

13) A 3.00-m long uniform thin rod that starts at rest takes 30.0 J of work to make the rod rotate with an angular speed 20.0 revolutions per minute about an axis perpendicular to the rod that passes through one end of the rod. What is the mass of the rod?
A) 3.22 kg B) 4.56 kg C) 0.344 kg D) 0.115 kg E) 0.245 kg

14) Which of the following are correct units for angular momentum?
A) kg·m2/s B) kg·m2/s3 C) kg·m/s2 D) kg·m/s E) kg·m2/s2

15) A 1000-kg car is traveling north at 20.0 m/s. A 1500-kg car is traveling north at 32.0 m/s.The 1500-kg collides with the rear of the 1000-kg car and they lock together. Ignoring external forces acting during the collision, what is the velocity of the cars immediately after the collision?

16) A person pushes on a doorknob with a force of 5.00 N perpendicular to the surface of the door. The doorknob is located 0.800 m from axis of the hinges of the door. The door begins to rotate with an angular acceleration of 2.00 rad/s2. What is the moment of inertia of the door about the hinges?

17) A long thin rod of length L has a linear density $\lambda(x) = Ax$ where x is the distance from the left end of the rod. What is the mass of the rod?

18) A 60.0-kg person is standing stationary relative to the surface of the earth as it rotates once a day. What is the angular momentum of the person about the center of the earth if he is located at a latitude 40.0°. The radius of the earth is 6.378 × 106 m.

19) A bicycle is traveling north at 5.0 m/s. The mass of the wheel, 2.0 kg, is uniformly distributed along the rim, which has a radius of 20 cm. What are the magnitude and direction of the angular momentum of the wheel about its axle?

20) A 40.0-kg child running at a speed 3.00 m/s jumps on a stationary playground merry-goround at a distance 1.50 m from the axis of rotation of the merry-go-round. The child is traveling tangential to the edge of the merry-go-round which has a 600 kg·m2 moment of inertia about its axis of rotation as she is running. What is the angular speed of the merry-go-round after the child jumps on it?