Practice Second Exam   Spring 2000   PHY 2053   Bernard F. Whiting

1   A horse-drawn wagon accelerates at 0.60 m/s^2. The wagon wheels each have a
    circumference of 5.0 m. What is the angular acceleration of the wheels in radians/s^2?

    1) 1.1   2) 0.35   3) 0.75   4) 0.90   5) 0.60

2   A 10-g bullet moving horizontally at 755 m/s strikes a tree, penetrates 14.5 cm into the
    tree and comes to rest. What is the average force of the tree on the bullet?

    1) 2.0×10^4 N   2) 4.0×10^4 N   3) 6.3×10^3 N   4) 2.1×10^3 N   5) 3.1×10^4 N

3   A 4 kg block is given an initial velocity of 4 m/s up an incline that makes an angle of 45°
    with the horizontal. The block moves a distance of 1.0 m up the slope before coming to
    rest. What is the magnitude of the work of friction on the block, in J?

    1) 22.0   2) 19.7   3) 4.3   4) 7.2   5) 59.7

4   A 24 N force is pulling an 8.0 kg box across a horizontal surface. The force acts at an
    angle of 30° above the surface. The coefficient of kinetic friction is 0.20 and the box
    moves a distance of 10 m. What is the work done by the kinetic frictional force?

    1) +157 J   2) +133 J   3) - 42 J   4) -157 J   5) -133 J

5   A 10 kg cart moving at 30 m/s bumps into a stationary 20 kg cart. The two carts couple
    and move together. What is the kinetic energy dissipated during the collision?

    1) 2500 J   2) 3000 J   3) 3500 J   4) 4000 J   5) 4500 J

6   What is the power delivered in lifting a 5.0-kg mass a height of 20 m in 10 seconds at a
    constant velocity?

    1) 98 w   2) 1000 w   3) 784 w   4) 196 w   5) 392 w

7   A 100-kg box is dragged along a horizontal road by a 100-N force acting at an angle of
    37° above the road. Upon moving a distance of 20 m, the speed of the box increases
    from 2.0 m/s to 4.0 m/s What is the average frictional force on the box?

    1) 60 N   2) 40 N   3) 80 N   4) 70 N   5) 50 N

8   A 2 kg block stretches a horizontal spring as it slides across a horizontal surface. The coefficient of kinetic friction is 0.5 and the spring constant is 200 N/m. When the spring is unstretched, the speed of the block is 5 m/s. By how much is the spring stretched when the block speed first drops to zero?

    1) 0.18 m   2) 0.48 m   3) 0.55 m   4) 0.45 m   5) 0.11 m

9   A 100 g bullet is fired horizontally at a 2 kg block that sits on a frictionless horizontal surface. The bullet enters the block with a speed of 700 m/s and exits the block with speed 500 m/s. What is the speed of the block, in m/s, immediately after the bullet passes through it?

    1) 100   2) 5   3) 20   4) 10   5) 50

10 A small car of mass M travels along a straight horizontal portion of a track, then enters a portion where the track is bent into a vertical circle to form a loop-the-loop. Assume the car to be small compared to R. What must be the minimum speed of the car at the top of the circle if it is to remain in contact with the track?

    1) $(2gR)^{0.5}$ 2) $(gR)^{0.5}$ 3) gR 4) MgR 5) $2gR$

11 A 5-kg bob is suspended at the end of a 4 m massless cord fastened to a support. The bob is displaced sideways to point P where the cord makes an angle of 37° with the vertical, and then released from rest. What is the speed of the bob when it is at its lowest point?

    1) 9 m/s   2) 6 m/s   3) 4 m/s   4) 8 m/s   5) 16 m/s

12 Several pennies are placed on a horizontal disk of 40-cm radius. When the disk is rotating about its central axis at 1/3 revolutions per second, it is observed that all the pennies at a radius R ≥ 30 cm slide off whereas all pennies inside that radius remain on the rotating disk. What is the coefficient of friction, μ_s, between the disk and the coins?

    1) 0.13   2) 0.17   3) 0.23   4) 0.31   5) 0.38

13 An airplane propeller with a radius of 1.6 m idles at a rotation rate of 4.0 rev/s. When power is applied, the tips if the propeller blades reach their maximum tangential speed of 300 m/s in an elapsed time of 6.0 s. What is the average angular acceleration of the propeller in radians/s^2?

    1) 27   2) 38   3) 21   4) 14   5) 33

14 A 2-kg object moving at 12.0 m/s to the right strikes a 50-kg object at rest on a frictionless horizontal surface and bounces back at 3.0 m/s to the left. What is the magnitude of the momentum of the 50-kg object after the impact, in kg m/s?

1) 24   2) 6.0   3) 15   4) 0.60   5) 30

15 A firecracker left at rest on a horizontal frictionless table explodes into two pieces, with masses 100 g and 400 g. The lighter mass flies away horizontally with an initial speed of 8 m/s. What is the initial speed of the heavier mass?

1) 8 m/s   2) 6 m/s   3) 4 m/s   4) 2 m/s   5) 0 m/s

16 Block A of mass M is moving with an initial velocity of $+V$. The block makes a head-on, perfectly elastic, one-dimensional collision with a stationary block of mass $2M$. After the collision, their velocities (V_{Af}, V_{Bf}) are:

1) *0, V/2*   2) *-V/3, 2V/3*   3) *-2V/3, V/3*   4) *-V, V*   5) none of these

17 A wheel undergoes an angular acceleration of 2 rad/s^2, starting from rest. At the instant the wheel finally reaches an angular velocity of 5.0 revolutions per second, what is the total number of revolutions it will have turned since starting?

1) 6.3   2) 63   3) 39   4) 27   5) 16

18 A 5-kg mass moving in the +x-direction at a speed of 4 m/s explodes into two pieces, one 3 kg and the other 2 kg. If, after the explosion, the 2-kg piece has a speed of 13 m/s on the +x-direction, what will be the speed of the 3-kg piece?

1) 9 m/s   2) 8 m/s   3) 6 m/s   4) 4 m/s   5) 2 m/s

19 Blocks A and B move towards each other. Block A has a mass of 2.0 kg and a velocity of 50 m/s while block B has a mass of 4.0 kg and a velocity of -25 m/s. they suffer a complete inelastic collision. What is the kinetic energy dissipated during the collision?

1) 0 J   2) 2500 J   3) 5000 J   4) 7500 J   5) none of these

20 An artificial satellite in a circular orbit around the sun has a period of 8.0 Earth-years. If the radius of the Earth's orbit about the sun is defined to be R and is assumed to be circular, what is the radius of the satellite's orbit about the sun?

1) R 2) $2R$ 3) $4R$ 4) $8R$ 5) $16R$