Quiz questions for Physics 1 (EPH) first half

Please make sure you understand how to do all of these questions. Questions from this pool will account for 20 points out of total 80 points during your midterm. This means if you can do all these at the least, you will receive an equivalent of a Passing grade (which is 24%) in your midterm.

12. A proton moving along the x axis has an initial velocity of 4.0×10^6 m/s and a constant acceleration of 6.0×10^{12} m/s^2. What is the velocity of the proton after it has traveled a distance of 80 cm?
    a. 5.1×10^6 m/s
    b. 6.3×10^6 m/s
    c. 4.8×10^6 m/s
    d. 3.9×10^6 m/s
    e. 2.9×10^6 m/s

    ANS: A PTS: 2 DIF: Average

20. A particle starts from rest at $x_i = 0$ and moves for 10 s with an acceleration of +2.0 cm/s^2. For the next 20 s, the acceleration of the particle is –1.0 cm/s^2. What is the position of the particle at the end of this motion?
    a. zero
    b. +3.0 m
    c. –1.0 m
    d. +2.0 m
    e. –3.0 m

    ANS: B PTS: 2 DIF: Average

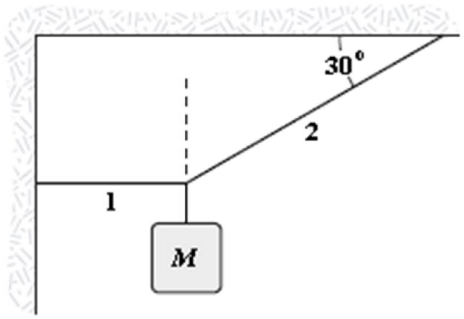
6. A particle starts from the origin at $t = 0$ with a velocity of $(16\hat{\mathbf{i}} - 12\hat{\mathbf{j}})$ m/s and moves in the xy plane with a constant acceleration of $\vec{\mathbf{a}} = (3.0\hat{\mathbf{i}} - 6.0\hat{\mathbf{j}})$ m/s^2. What is the speed of the particle at $t = 2.0$ s?
    a. 52 m/s
    b. 39 m/s
    c. 46 m/s
    d. 33 m/s
    e. 43 m/s

    ANS: D PTS: 2 DIF: Average

11. A rock is projected from the edge of the top of a building with an initial velocity of 12.2 m/s at an angle of 53° above the horizontal. The rock strikes the ground a horizontal distance of 25 m from the base of the building. Assume that the ground is level and that the side of the building is vertical. How tall is the building?
    a. 25.3 m
    b. 29.6 m
    c. 27.4 m
    d. 23.6 m
    e. 18.9 m

    ANS: D PTS: 2 DIF: Average

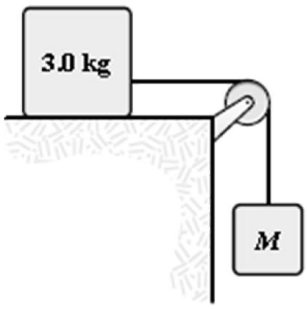
2. If $M = 2.0$ kg, what is the tension in string 1?



a. 1.2 N
b. 11 N
c. 34 N
d. 3.5 N
e. 40 N

ANS: C PTS: 2 DIF: Average

55. The system shown is released from rest and moves 50 cm in 1.0 s. What is the value of *M*? All surfaces are frictionless.



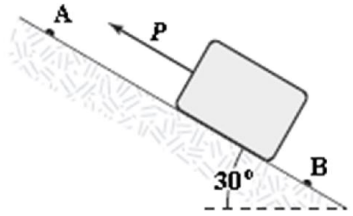
a. 0.42 kg
b. 0.34 kg
c. 0.50 kg
d. 0.59 kg
e. 0.68 kg

ANS: B PTS: 2 DIF: Average

11. A 0.50-kg mass attached to the end of a string swings in a vertical circle (radius = 2.0 m). When the mass is at the lowest point on the circle, the speed of the mass is 12 m/s. What is the magnitude of the force of the string on the mass at this position?
a. 31 N
b. 36 N
c. 41 N
d. 46 N
e. 23 N

ANS: C PTS: 2 DIF: Average

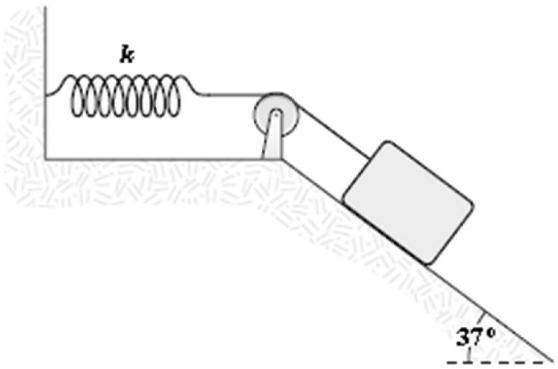
17. A 2.0-kg block slides down a frictionless incline from point A to point B. A force (magnitude $P = 3.0$ N) acts on the block between A and B, as shown. Points A and B are 2.0 m apart. If the kinetic energy of the block at A is 10 J, what is the kinetic energy of the block at B?



a. 27 J
b. 20 J
c. 24 J
d. 17 J
e. 37 J

ANS: C PTS: 2 DIF: Average

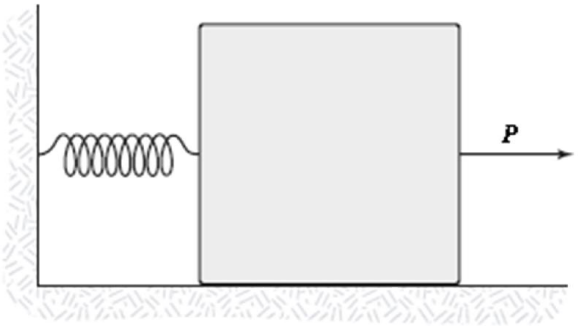
23. A 2.0-kg block situated on a frictionless incline is connected to a light spring ($k = 100$ N/m), as shown. The block is released from rest when the spring is unstretched. The pulley is frictionless and has negligible mass. What is the speed of the block when it has moved 0.20 m down the plane?



a. 76 cm/s
b. 68 cm/s
c. 60 cm/s
d. 82 cm/s
e. 57 cm/s

ANS: C PTS: 2 DIF: Average

5. A 12-kg block on a horizontal frictionless surface is attached to a light spring (force constant = 0.80 kN/m). The block is initially at rest at its equilibrium position when a force (magnitude $P = 80$ N) acting parallel to the surface is applied to the block, as shown. What is the speed of the block when it is 13 cm from its equilibrium position?



a. 0.78 m/s
b. 0.81 m/s
c. 0.71 m/s
d. 0.58 m/s
e. 0.64 m/s

ANS: A PTS: 2 DIF: Average

25. A 3.0-kg object moving in the positive *x* direction has a one-dimensional elastic collision with a 5.0-kg object initially at rest. After the collision the 5.0-kg object has a velocity of 6.0 m/s in the positive *x* direction. What was the initial speed of the 3.0 kg object?
a. 6.0 m/s
b. 7.0 m/s
c. 4.5 m/s
d. 8.0 m/s
e. 5.5 m/s

ANS: D PTS: 2 DIF: Average

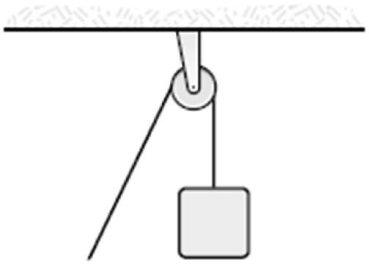
21. A 10-g bullet moving horizontally with a speed of 2.0 km/s strikes and passes through a 4.0-kg block moving with a speed of 4.2 m/s in the opposite direction on a horizontal frictionless surface. If the block is brought to rest by the collision, what is the kinetic energy of the bullet as it emerges from the block?
a. 0.51 kJ
b. 0.29 kJ
c. 0.80 kJ
d. 0.13 kJ
e. 20 kJ

ANS: A PTS: 3 DIF: Challenging

7. A wheel rotates about a fixed axis with an initial angular velocity of 20 rad/s. During a 5.0-s interval the angular velocity decreases to 10 rad/s. Assume that the angular acceleration is constant during the 5.0-s interval. How many radians does the wheel turn through during the 5.0-s interval?
a. 95 rad
b. 85 rad
c. 65 rad
d. 75 rad
e. 125 rad

ANS: D PTS: 2 DIF: Average

15. 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

ANS: D PTS: 2 DIF: Average

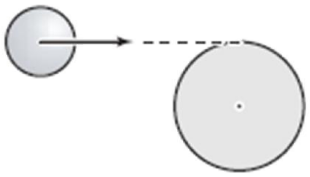
77. A solid sphere, a solid cylinder, a spherical shell, and a hoop all have the same mass and radius. Each are rolling on a horizontal surface with the same center of mass speed, and then they roll up identical inclines. Which one goes the greatest distance up its incline?
a. the hoop
b. the solid sphere
c. the spherical shell
d. the cylinder
e. They all go the same distance up their inclines.

ANS: A PTS: 2 DIF: Average

5. A solid cylinder of radius R = 1.0 m and mass 10 kg rotates about its axis. When its angular velocity is 10 rad/s, its angular momentum (in kg·m^2/s) is
a. 50.
b. 20.
c. 40.
d. 25.
e. 70.

ANS: A PTS: 2 DIF: Average

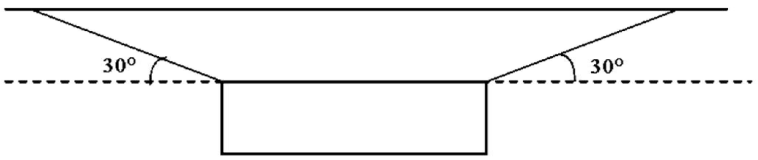
16. A particle of mass m = 0.10 kg and speed v_0 = 5.0 m/s collides and sticks to the end of a uniform solid cylinder of mass M = 1.0 kg and radius R = 20 cm. If the cylinder is initially at rest and is pivoted about a frictionless axle through its center, what is the final angular velocity (in rad/s) of the system after the collision?



a. 8.1
b. 2.0
c. 6.1
d. 4.2
e. 10

ANS: D PTS: 3 DIF: Challenging

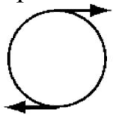
21. An object of mass *m* is suspended by two coplanar wires, as shown below. The tension in each wire has a magnitude given by

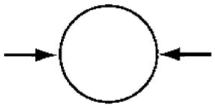


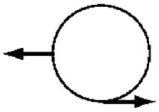
a. $\frac{\sqrt{2}}{2}mg$.
b. $\frac{\sqrt{3}}{2}mg$.
c. $\frac{1}{2}mg$.
d. mg.
e. $\sqrt{2}mg$.

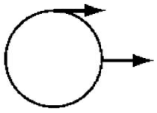
ANS: D PTS: 2 DIF: Average

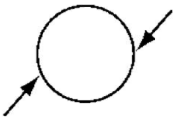
18. Pairs of forces of equal magnitude act on identical cylinders as shown in the figures. In which example is the cylinder in translational and rotational equilibrium?

a.


b.


c.


d.


e. 

ANS: B PTS: 1 DIF: Easy

4. Two stars of masses M and $6M$ are separated by a distance D. Determine the distance (measured from M) to a point at which the net gravitational force on a third mass would be zero.
   a. 0.41 D
   b. 0.33 D
   c. 0.37 D
   d. 0.29 D
   e. 0.14 D

   ANS: D PTS: 2 DIF: Average