Q1 A 50-kg box is pulled at constant speed 10 m up a plane 60 degrees above the horizontal by a force parallel to the plane (see figure 1). The coefficient of kinetic friction between the box and the plane is 0.30. How much work is done by the applied force?

A1: 5.0 kJ
A2: 3.5 kJ
A3: 5.7 kJ
A4: 0.57 kJ
A5: 4.2 kJ

Q2 A 3.0-kg is attached to a spring of force constant 20 N/m (see figure 2) and rests on a frictionless surface. The block is pulled 2.0 m to the right and released from rest. What is its kinetic energy when it is 1.0 m from the equilibrium position?

A1: 30 J
A2: 10 J
A3: 40 J
A4: 50 J
A5: 25 J

Q3 A 20-kg mass is attached to a spring (k=380 N/m) that passes over a pulley as shown in figure 3. The pulley is frictionless and massless. The mass is released from rest with the spring unstretched. What is
the speed of the mass at the instant when it has dropped a vertical distance of 0.4 m ?
A1 2.2 m/s
A2 2.5 m/s
A3 1.5 m/s
A4 4.8 m/s
A5 3.6 m/s

Q4 A particle moves 5 m in the positive x-direction while being acted upon by a constant force F=(4*i + 2*j) N, where i and j are unit vectors along the x-axis and the y-axis, respectively. What is the work done on the particle by this force?

A1: +20 J
A2: +10 J
A3: +30 J
A4: -15 J
A5: zero J

Q5 Two masses are connected as shown in figure 4. The coefficient of kinetic friction between the 2.0-kg mass and the surface is 0.400. The system starts from rest. What is the speed of the 6.0-kg mass at the instant when it has fallen 1.5 m? Assume that the pulley is massless and frictionless.

A1: 4.37 m/s
A2: 3.74 m/s
A3: 5.00 m/s
A4: 5.05 m/s
A5: 5.42 m/s

Q6 A 2.0-kg block is pushed on a rough horizontal plane by a 12-N force acting parallel to the plane. If the block moves with a constant speed of 1.5 m/s, how much power is lost due to the frictional force?

A1: +18 W
A2: +11 W
A3: -11 W
A4: +29 W
A5: -29 W

Q7 Which of the following bodies has the largest kinetic energy?

A1: Mass 2M and speed 3V .
A2: Mass 3M and speed V .
A3: Mass 3M and speed 2V .
A4: Mass M and speed 4V .
A5: Mass 4M and speed 2V .

Q8 The only force acting on a 5.0-kg object moving along the x-axis is shown in figure 5. what is the change in the speed of the object between t=1 s and t=3 s?

A1: 0.8 m/s
A2: 1.1 m/s
A3: 1.6 m/s

A4: 2.3 m/s
A5: 4.0 m/s

Q9 A 2.0-kg object moving with a speed of 5.0 m/s in the positive x-direction collides and sticks to a 3.0-kg object originally moving with a speed of 2.0 m/s in the same direction. What is the final speed of the two masses?

A1: 3.2 m/s
A2: 5.0 m/s
A3: 2.0 m/s
A4: 7.0 m/s
A5: 1.2 m/s

Q10 Three particles are placed in the xy plane. A 4-gram particle is located at (3 , 4) m, and a 6-gram particle is located at (-2 , -6)m. Where must a 2-gram particle be placed so that the center of mass of this three-particle system is located at the origin?

A1: (0 , 10) m
A2: (6 , -2) m
A3: (5 , 10) m
A4: (9 , 16) m
A5: (-2 , 4) m

Q11 A 2.0-kg particle has a velocity of 4.0 m/s in the positive x direction and a 3.0-kg particle has a velocity of 5.0 m/s in the positive y direction. What is the speed of their center of mass?

A1: 3.4 m/s
A2: 3.8 m/s
A3: 5.0 m/s
A4: 4.4 m/s
A5: 4.6 m/s

Q12 A uniform beam has a weight of 120 N and is supported as shown in figure 6. What is the magnitude of the force by the pin on the beam?

A1: 75 N
A2: 94 N
A3: 88 N
A4: 63 N
A5: 150 N

Q13 A traffic light hangs from a structure as shown in figure 7. The uniform rod AB is 4.5 m long and has a mass of 5.0 kg. The mass of the traffic light is 10.0 kg. Determine the tension in the horizontal massless cable CD.

A1: 121 N
A2: 160 N
A3: 91 N
A4: 100 N
A5: 145 N

Q14 A wheel, starting from rest, turns through 8.0 revolutions in a time interval of 17 s. Assuming constant angular acceleration, what is the angular speed of the wheel at the end of this time interval?

A1: 5.9 rad/s
A2: 8.5 rad/s
A3: 3.0 rad/s
A4: 0.9 rad/s
A5: 1.7 rad/s

Q15 Four identical particles, each with mass m, are arranged in the xy plane as shown in figure 8. They are connected by light rods to form a rigid body. If m=2.0 kg and a=1.0 m, the moment of inertia of this system about the y-axis is:

A1: 12 kg*m**2
A2: 16 kg*m**2
A3: 4.0 kg*m**2
A4: 9.6 kg*m**2
A5: 4.8 kg*m**2

Q16 A 6-kg particle moves to the right with a speed of 4 m/s as shown in figure 9. Its angular momentum about the origin 0 is:

A1: 144 kg*m**2/s
A2: 288 kg*m**2/s
A3: 24 kg*m**2/s

A4: 249 kg*m**2/s
A5: zero kg*m**2/s

Q17 Two disks are mounted on a frictionless axis as shown in figure 11. The first disk has a
moment of inertia I and is rotating with an angular speed of 6.00 rad/s. The second disk has
a moment of inertia 2I and is rotating with an angular speed of 12.0 rad/s. The two disks
are slowly forced toward each other, along the axis, until they stick together. What is their
common angular speed?

A1: 10.0 rad/s
A2: 10.4 rad/s
A3: 9.17 rad/s
A4: 6.00 rad/s
A5: 18.0 rad/s

Q18 A wheel with a moment of inertia of 5.0 kg*m**2 and a radius of 0.25 m rotates about a fixed
axis perpendicular to the wheel and through its center as shown in figure 10. A force of 2.0 N is
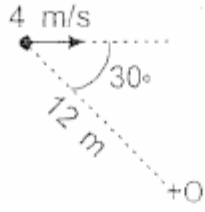applied tangentially to the rim. As the wheel rotates through one revolution, what is the work
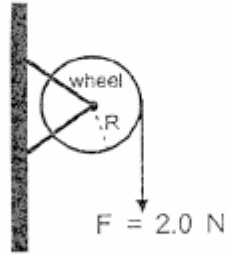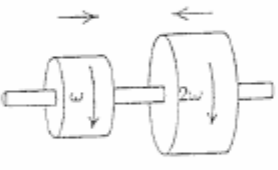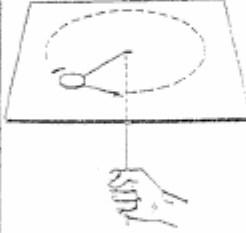done by the force?
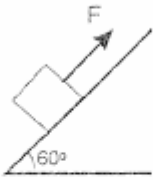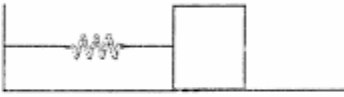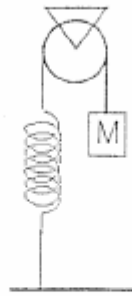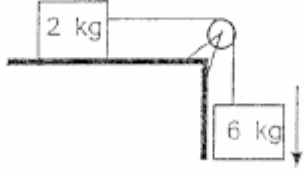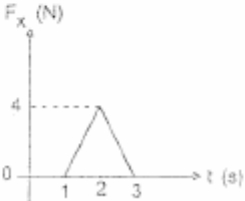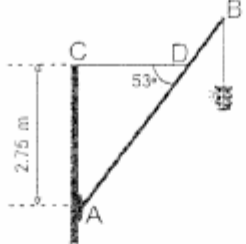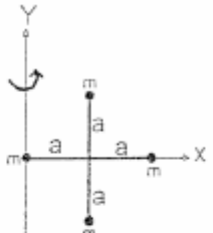
A1: 3.14 W
A2: 0.50 W
A3: 2.00 W
A4: 1.57 W
A5: 2.50 W

Q19 A uniform solid sphere has a mass of 4.0 kg and a radius of 0.10 m. Its moment of inertia
about its center of mass is 0.016 kg*m**2. It rolls without slipping on a horizontal surface. The
linear speed of its center of mass is 4.0 m/s. What is its total kinetic energy?

A1: 44.8 J
A2: 32.0 J
A3: 12.8 J
A4: 19.2 J
A5: 57.6 J

Q20 A mass m is attached to a rope passing through a small hole in a horizontal frictionless
surface (figure 12). The mass is initially rotating with a linear speed v in a circle of radius
R. The rope is slowly pulled from below, decreasing the radius to R/2. Which of the following
statements is CORRECT?

A1: The linear speed of the mass increases .
A2: The angular speed of the mass is reduced .
A3: The kinetic energy of the mass stays the same .
A4: The linear speed of the mass stays the same .
A5: The angular speed of the mass does not change .

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12