Term 082

Q2.
A 4.0-kg cart starts up an incline with a speed of 3.0 m/s and comes to rest 2.0 m up the incline. The net work done on the cart is:

A) –18 J
B) +18 J
C) +12 J
D) –12 J
E) +1.0 J

Q3.
A block of mass 1.6 kg, resting on a horizontal frictionless surface, is attached to a horizontal spring fixed at one end. The spring, having a spring constant of 1.0×10^3 N/m, is compressed to x = -2.0 cm (x = 0.0 is the equilibrium position) and the block is released from rest. The speed of the block as it passes through the position x = - 1.0 cm is:

A) 0.43 m/s
B) 0.91 m/s
C) 0.73 m/s
D) 0.22 m/s
E) 0.10 m/s

Q4.
A 3.0-kg mass has an initial velocity $\mathbf{v_o} = (6.0\,\mathbf{i} - 2.0\,\mathbf{j})$ m/s. A single force **F** is applied for 5.0 s which changes its velocity to $\mathbf{v} = (8.0\,\mathbf{i} + 4.0\,\mathbf{j})$ m/s. Find the average power delivered by the force in this interval.

A) 12 W
B) 25 W
C) 9.8 W
D) 6.6 W
E) 28 W

A projectile of mass m = 0.200 kg is fired at an angle of 60.0 degrees above the horizontal with a speed of 20.0 m/s. Find the work done on the projectile by the gravitational force during its flight from its firing point to the highest point on its trajectory.

A) –30.0 J
B) 9.60 J
C) –12.0 J
D) 40.0 J
E) –20.0 J

Q6.
A 0.500-kg block is pushed against a horizontal spring fixed at one end (the block is NOT attached to the spring), compressing the spring 10.0 cm. The spring has a spring constant of 1.00×10^2 N/m. The block lies on a horizontal floor having a coefficient of kinetic friction $\mu_k = 0.200$. Find the total distance traveled by the block after being released from rest.

A) 51.0 cm
B) 20.0 cm
C) 10.0 cm
D) 6.00 cm
E) 80.0 cm

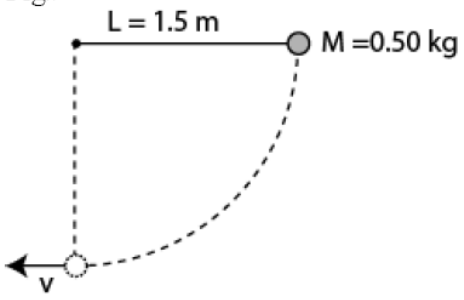
Q7.
A simple pendulum consists of a 2.00 kg mass attached to a 1.00 m long light string. It is given an initial speed of 0.500 m/s at A where the pendulum makes an angle θ with the vertical as shown in Fig.1. If its speed at the lowest point B is 1.70 m/s, find the value of the angle θ.

A) 30.1 degrees
B) 45.2 degrees
C) 20.7 degrees
D) 15.9 degrees
E) 10.7 degrees

Term 072

Q1.
Fig 1 shows a simple pendulum, consisting of a ball of mass M = 0.50 kg, attached to one end of a massless string of length L = 1.5 m. The other end is fixed. If the ball is initially released from rest with the string horizontal, then its speed at the lowest point is

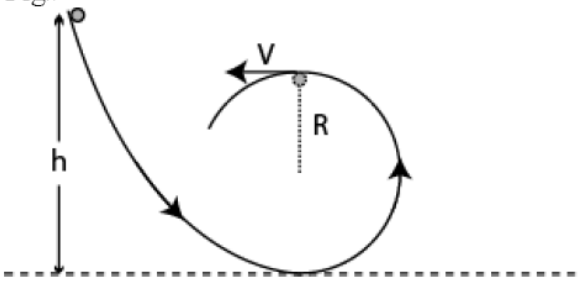
Fig#



A) 5.4 m/s
B) 4.4 m/s
C) 9.8 m/s
D) 17 m/s
E) 2.2 m/s

Q2.
A ball slides without friction around a loop-the-loop (see Fig 2). A ball is released, from rest, at a height h from the left side of the loop of radius R. What is the ratio (h/R) so that the ball has a speed $V = \sqrt{Rg}$ at the highest point of the loop? (g = acceleration due to gravity)

Fig#



A) (5/2)
B) (3/2)
C) (2/1)
D) (7/2)
E) (9/2)

Q3.
A person pushes horizontally a 10 kg box at a constant velocity 1.5 m/s. The coefficient of kinetic friction between the box and the horizontal floor is 0.30. What is the rate of work that the person does in pushing the box?

A) 44W
B) 23W
C) 54W
D) 16W
E) 0 W

Q4.
A worker does 500 J of work in moving a 20 kg box a distance D on a rough horizontal floor. The box starts from rest and its final velocity after moving the distance D is 4.0 m/s. Find the work done by the friction between the box and the floor in moving the distance D.

A) –340 J
B) –500 J
C) –160 J
D) – 98 J
E) 0 J

Q5.
A 2.0 kg block is released from rest 60 m above the ground. Take the gravitational potential energy of the block to be zero at the ground. At what height above the ground is the kinetic energy of the block equal to half its gravitational potential energy?
(Ignore air resistance).

A) 40 m
B) 30 m
C) 20 m
D) 10 m
E) 25 m

Q6.
A 2.2 kg block starts from rest on a rough inclined plane that makes an angle of 30° above the horizontal. The coefficient of kinetic friction is 0.25. As the block moves 3.0 m down the plane, the change in the mechanical energy of the block is:

A) −14 J
B) −9.8 J
C) 9.8 J
D) −18 J
E) 18 J

Q7.
A 0.50 kg block attached to an ideal spring with a spring constant of 80 N/m oscillates on a horizontal frictionless surface. The speed of the block is 0.50 m/s, when the spring is stretched by 4.0 cm. The maximum speed the block can have is:

A) 0.71 m/s
B) 0.32 m/s
C) 0.55 m/s
D) 0.23 m/s
E) 0.93 m/s

Term 071

Q1.
An 800 kg car is traveling at velocity $\left(12\,\hat{i}\right)$m/s. When the brakes are applied, the car changes its velocity to $\left(12\,\hat{j}\right)$m/s in 4.0 s. What is the change in kinetic energy of the car in this time period?

A) 0 J
B) 2.9×10^4 J
C) $5.8\times 10^4\left(\hat{j}-\hat{i}\right)$ J
D) 4.8×10^4 J
E) $\left(12\hat{i}-12\hat{j}\right)$ J

Q2.
An ideal spring is hung vertically from the ceiling. When a 2.0 kg mass hangs at rest from it, the spring is extended 6.0 cm from its relaxed length. A downward external force is now applied to the mass to extend the spring an additional 10 cm. While the spring is being extended by the external force, the work done by the spring is:

A) −3.6 J
B) −3.3 J
C) −1.0 J
D) 1.8 J
E) 3.6 J

Q3.
A single force acts on a 5.0 kg object in such a way that the position of the object as a function of time is given by $x = 10.0t - 5.0t^2$, with x is in meters and t is in seconds. Find the work done on the object from $t = 0$ to $t = 4.0$ s.

A) 2000 J
B) 900 J
C) 4000 J
D) 400 J
E) 500 J

Q4.
A 2000 kg elevator moves 20 m upward in 4.9 sec at a constant speed. At what average rate does the force from the cable do the work on the elevator?

A) 80000 W
B) 25000 W
C) 75000 W
D) 10000 W
E) 150 W

Q5.
A 10.0 kg block is released from rest 100 m above the ground. When it has fallen 50 m, its kinetic energy is:

A) 4900 J
B) 9800 J
C) 1200 J
D) 120 J
E) 60 J

Q6.
A 4.0 kg block is initially moving to the right on a horizontal frictionless surface at a speed of 5.0 m/s. It then compresses a horizontal spring of spring constant 200 N/m. At the instant when the kinetic energy of the block is equal to the potential energy of the spring, the mechanical energy of the block-spring system is:

A) 50 J
B) 10 J
C) 25 J
D) 75 J
E) 15 J

Q7.
A 5.0 kg block starts up a 30° incline with 198 J of kinetic energy. The block slides up the incline and stops after traveling 4.0 m. The work done by the force of friction between the block and the incline is:

A) -100 J
B) -198 J
C) -98 J
D) -298 J
E) 0 J

Term 062

Q1.
A 10.0 *kg* box slides with a constant speed a distance of 5.00 *m* downward along a rough slope that makes an angle of 30.0° with the horizontal. The work done by the force of gravity is:

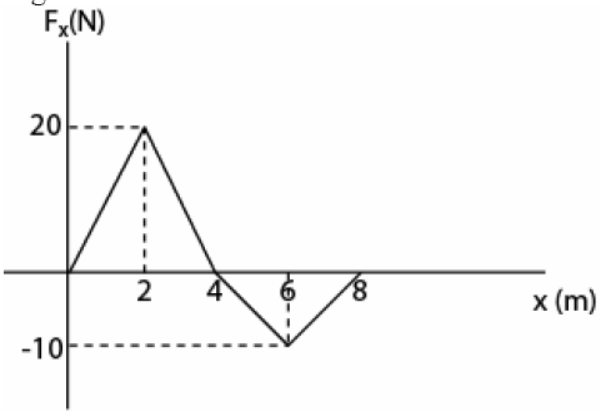
A) 245 *J*
B) -490 *J*
C) -960 *J*
D) 424 *J*
E) 400 *J*

Q2.
A block is attached to the end of an ideal spring and moved from coordinate x_i to coordinate x_f . The relaxed position is at $x = 0$. For which values of x_i and x_f that are given below, the work done by spring is positive?

A) $x_i = -4$ *cm* and $x_f = -2$ *cm*
B) $x_i = -2$ *cm* and $x_f = 4$ *cm*
C) $x_i = -2$ *cm* and $x_f = -4$ *cm*
D) $x_i = 2$ *cm* and $x_f = -4$ *cm*
E) $x_i = 2$ *cm* and $x_f = 4$ *cm*

Fig. 1 gives the only force F_x that can act on a particle. If the particle has a kinetic energy of 10 J at $x = 0$, find the kinetic energy of the particle when it is at $x = 8.0$ m.

Fig#



A) 30 J
B) 20 J
C) 0 J
D) 60 J
E) 10 J

A 200 kg box is pulled along a horizontal surface by an engine. The coefficient of friction between the box and the surface is 0.400. The power the engine delivers to move the box at constant speed of 5.00 m/s is:

A) 3920 W
B) 1960 W
C) 980 W
D) 490 W
E) 0 W

Q5.
A 2.0 kg object is connected to one end of an unstretched spring which is attached to the ceiling by the other end and then the object is allowed to drop. The spring constant of the spring is 196 N/m. How far does it drop before coming to rest momentarily?

A) 0.20 m
B) 0.10 m
C) 0.40 m
D) 0.80 m
E) 0.50 m

Q6.
A 2.0 kg block is thrown upward from the ground. At what height above the ground will the gravitational potential energy of the Earth-block system have increased by 490 J?

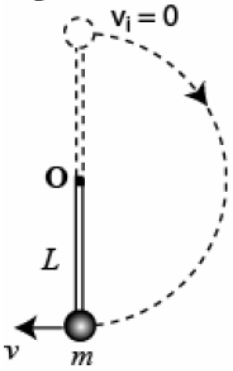
A) 25 m
B) 50 m
C) 12 m
D) 8.0 m
E) 18 m

Q7.
An ideal spring (compressed by 7.00 *cm* and initially at rest,) fires a 15.0 *g* block horizontally across a frictionless table top. The spring has a spring constant of 20.0 *N/m*. The speed of the block as it leaves the spring is:

A) 2.56 *m/s*
B) 1.90 *m/s*
C) 3.64 *m/s*
D) 8.12 *m/s*
E) 5.25 *m/s*

Q8.
A small object of mass *m* on the end of a massless rod of length *L* is held vertically, initially. The rod is pivoted at the other end **O**. The object is then released from rest and allowed to swing down in a circular path as shown in Fig. 2. What is the speed (*v*) of the object at the lowest point of its swing? (Assume no friction at the pivot)

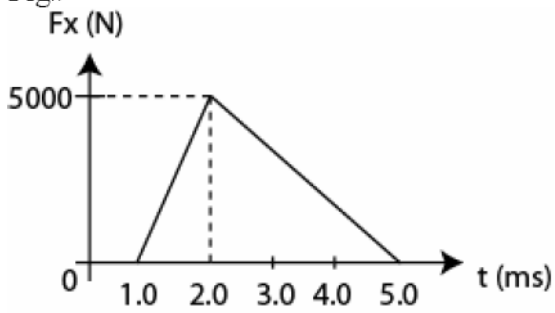
Fig#



A) $\sqrt{4gL}$
B) $\sqrt{2gL}$
C) $\sqrt{gL}$
D) $\sqrt{gL/2}$
E) $\sqrt{gL/4}$

Q9.
An impulsive force F_x as a function of time (in *ms*) is shown in the Fig. 3 as applied to an object ($m = 5.0\ kg$) at rest. What will be its final speed?

Fig#



A) 2.0 *m/s*.
B) - 3.2 *m/s*.
C) 8.0 m/s.
D) 16 m/s.
E) 4.2 m/s.

Term 061

Q1.
A 16 *kg* crate falls from rest from a height of 1.0 *m* onto a spring scale with a spring constant of $2.74 \times 10^3\ N/m$. Find the maximum distance the spring is compressed.

A) 40 cm
B) 2.0 cm
C) 60 cm
D) 7.0 cm
E) 5.0 cm

Q2.
A 4.0 *kg* cart starts up an incline with a speed of 3.0 *m/s* and comes to rest 2.0 *m* up the incline. The net work done on the cart is:

A) -18 *J*
B) 8.0 *J*
C) -12 *J*
D) 6.0 *J*
E) -20 *J*

Q3.
A net horizontal force of 50 *N* is acting on a 2.0 *kg* crate that starts from rest on a horizontal frictionless surface. At the instant the object has traveled 2.0 *m*, the rate at which this net force doing work is:

A) 500 *W*
B) 25 *W*
C) 75 *W*
D) 100 *W*
E) 2.5 *W*

Q4.
At time $t = 0$ a single force ($\vec{F}$) acts on a 2.0 *kg* particle and changes its velocity from $\vec{v}_i = (4.0\hat{i} - 3.0\hat{j})m/s$ at $t = 0$ to $\vec{v}_f = (4.0\hat{i} + 3.0\hat{j})m/s$ at t = 3.0 *s*. During this time the work done by $\vec{F}$ on the particle is:

A) 0
B) 6.0 *J*
C) 2.0 *J*
D) 50 *J*
E) 10 *J*

Q5.
A 2.2 *kg* block starts from rest on a rough inclined plane that makes an angle of 25° with the horizontal. The coefficient of kinetic friction is 0.25. As the block slides 2.0 *m* down the plane, the mechanical energy of the Earth-block system changes by:

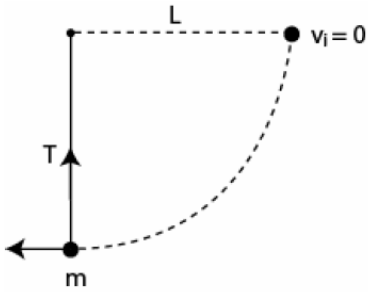
A) −9.8 *J*
B) 0 *J*
C) 9.8 *J*
D) −18 *J*
E) −11 *J*

Q6.
An ideal spring with a 20 *N/m* spring constant is compressed by a 10 *N* force. The potential energy stored in the spring is:

A) 2.5 *J*
B) 0.50 *J*
C) 5.0 *J*
D) 10 *J*
E) 200 *J*

Q7.
An object of mass *m*, attached to a light cord of length *L*, is held horizontally from a fixed support as shown in Fig 1. The object is then released from rest. What is the tension force in the cord when the object is at the lowest point of its swing?

Fig# 1



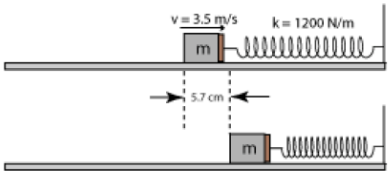
A) 3 *mg*
B) *mg*
C) 2 *mg*
D) *mg* / 2
E) *mgL*

Q8.
A block of mass 2.0 *kg* is initially moving to the right on a horizontal frictionless surface at a speed 5.0 *m/s*. It then compresses a spring of spring constant 100 *N/m*. At the instant when the kinetic energy of the block is equal to the potential energy of the spring, the spring is compressed a distance of:

A) 0.50 *m*
B) 0.25 *m*
C) 1.0 *m*
D) 0.75 *m*
E) 0.10 *m*

Term 052

8. A 2.0-kg block slides on a rough horizontal table top (see Fig 2). Just before it hits a horizontal ideal spring its speed is 5.0 m/s. It hits the spring and compresses it 10.0 cm before coming momentarily to rest. If the spring constant is 1200 N/m, the work done by friction is:
   A) 0
   B) -2.6 J
   C) -19 J
   D) -0.70 J
   E) -6.5 J



answer C

6. A varying force F_x acts on a particle of mass m = 2.0 kg as shown in Figure 1. Find the speed of the particle at x = 8.0 m, if the kinetic energy at x = 0 is 9.0 J.

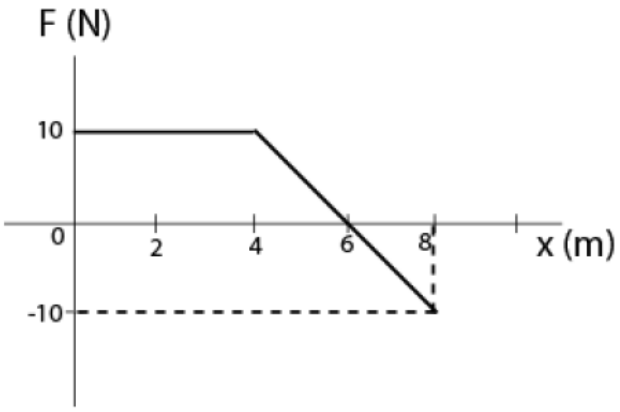


Figure 1

A) 5.0 m/s
B) 7.0 m/s
C) 6.0 m/s
D) 4.0 m/s
E) 3.0 m/s

Answer B