Questions

Chapter 7
Kinetic Energy and Work

7-1 What is Energy?
7-2 Kinetic Energy
7-3 Work
7-4 Work and Kinetic Energy
7-5 Work Done by the Gravitational Force
7-6 Work Done by a General Variable Force
7-7 Work Done by a Spring Force
7-8 Power

7-3 Work
M2-041

A particle moves in the x-y plane from the point (0,1) m to point (3,5) m while being acted upon by a constant force $\mathbf{F} = 4\mathbf{i} + 2\mathbf{j} + 4\mathbf{k}$ (N). The work done on the particle by this force is:

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

Answer D

7-3 Work
M2-041

Which of the following statements is CORRECT?

A) The work done by a force is always equal to the product of the force and the distance traveled.
B) The centripetal force acting on a particle rotating in a circle does no work on the particle.
C) When an object is displaced horizontally, the gravitational force does work on it.
D) When an object is displaced horizontally on a table, the normal force does work on it.
E) If a person lifts a heavy block a vertical distance, then his work is zero.

Answer B

7-4 Work and Kinetic Energy
M2-061

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

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

Answer C

7-4 Work and Kinetic Energy
M2-061

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

Answer D

7-4 Work and Kinetic Energy
M2-042

A 5.0-kg block is moving horizontally at 6.0 m/s. In order to change its speed to 10.0 m/s, the net work done on the block must be :

A) 40 J
B) 160 J
C) 90 J
D) 400 J
E) 550 J

Answer B

7-4 Work and Kinetic Energy
M2-041

A projectile is fired from the top of a 40 m high building with a speed of 20 m/s. What will be its speed when it strikes the ground?

A) 82 m/s
B) 10 m/s
C) 34 m/s
D) 16 m/s
E) 50 m/

Answer C

7-5 Work Done by the Gravitational Force
M2-062

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:

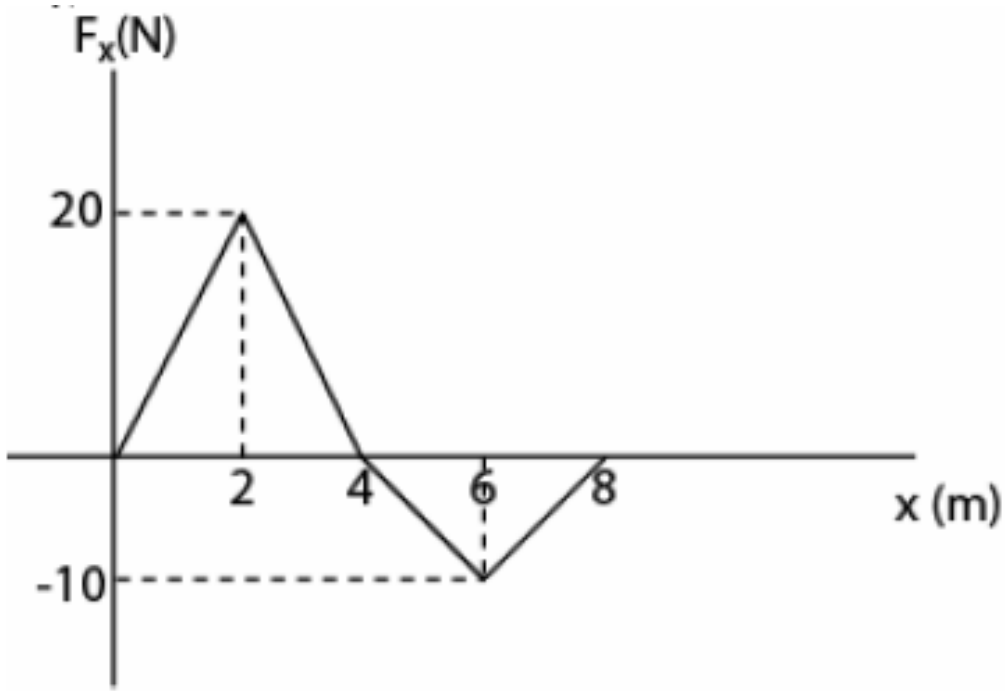
A) 400 J
B) -490 J
C) -960 J
D) 424 J
E) 245 J

Answer E

7-6 Work Done by a General Variable Force
M2-062

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.

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



Answer C

7-7 Work Done by a Spring Force
M2-062

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 = 2 cm and x_f = 4 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 = -4 cm and x_f = -2 cm

Answer E

7-7 Work Done by a Spring Force
M2-061

A 16 kg crate falls from rest from a height of 1.0 m onto a spring scale with a spring constant of 2.74×10^3 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

Answer A

7-7 Work Done by a Spring Force
M2-042

A 3.00 kg block is dropped from a height of 40 cm onto a spring of spring constant k (see Fig 2). If the maximum distance the spring is compressed = 0.130 m, find k.

A) 490 N/m
B) 980 N/m
C) 1840 N/m
D) 1250 N/m
E) 2800 N/m

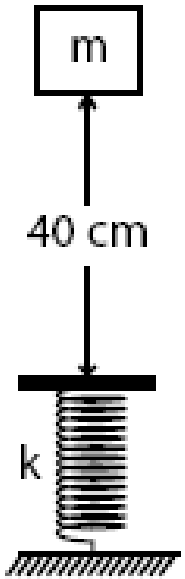


Figure 2

Answer C

7-7 Work Done by a Spring Force
M2-041

A 3.0 kg block is released from a compressed spring (k=120 N/m). It travels over a horizontal surface (mu =0.20) for a distance of 2.0 m before coming to rest, Fig 1. How far was the spring compressed before being released ?

A) 0.44 m
B) 0.39 m
C) 0.23 m
D) 0.13 m
E) 0.56 m

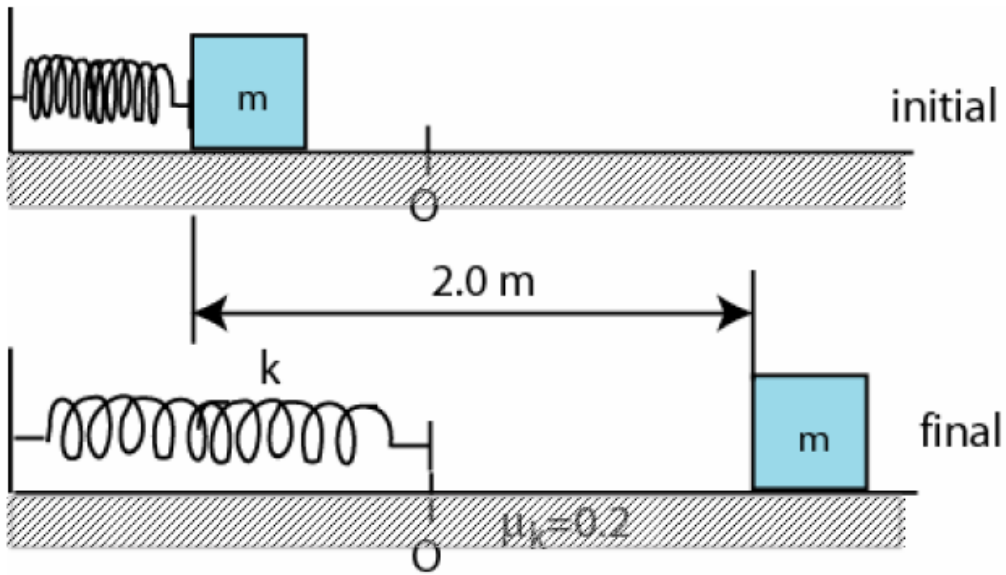


Figure 1

Answer A

7-8 Power
M2-062

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

Answer A

7-8 Power
M2-061

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

Answer B

7-8 Power
M2-042

A helicopter lifts an 80 kg man vertically from the ground by means of a cable. The upward acceleration of the man is 2.0 m/s^2. Find the rate at which the work is being done on the man by the tension of the cable when the speed of the man is 1.5 m/s.

A) 1.8×10^3 W
B) 1.1×10^3 W
C) 1.2×10^4 W
D) 1.4×10^3 W
E) 2.5×10^4 W

Answer D

7-8 Power
M2-042

A force **F** = (3.00 **i** +7.00 **j**) N acts on a 2.00 kg object that moves from an initial position $\mathbf{r}_1$=(3.00**i** - 2.00**j**) m to a final position $\mathbf{r}_2$ = (5.00 **i** + 4.00 **j**) m in 4.00 s . What is the average power due to the force during that time interval?

A) 8.0 W
B) 7.00 W
C) 12.00 W
D) 6.00 W
E) 16.0 W

Answer C

7-8 Power
M2-041

A car accelerates from zero to 30 m/s in 1.5 s. Assuming the same average power is delivered by the car, how long does it take to accelerate it from zero to 60 m/s. (Ignore friction).

A) 6.0 s
B) 3.0 s
C) 4.5 s
D) 1.5 s
E) 9.0 s

Answer A