Questions

Chapter 8
Potential Energy and Conservation of Energy

8-1 Work and Potential Energy
8-2 Path Independence of Conservative Forces
8-3 Determining Potential Energy Values
8-4 Conservation of Mechanical Energy
8-5 Work Done on a System by an External Force
8-6 Conservation of Energy

8-3 Determining Potential Energy Values
M2-062

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

Answer C

8-3 Determining Potential Energy Values
M2-061

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

Answer B

8-4 Conservation of Mechanical Energy
M2-062

A 2.0 kg object is connected to one end of an un-stretched 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) 0.80 m
B) 0.10 m
C) 0.40 m
D) 0.20 m
E) 0.50 m

Answer D

8-4 Conservation of Mechanical Energy
M2-062

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:

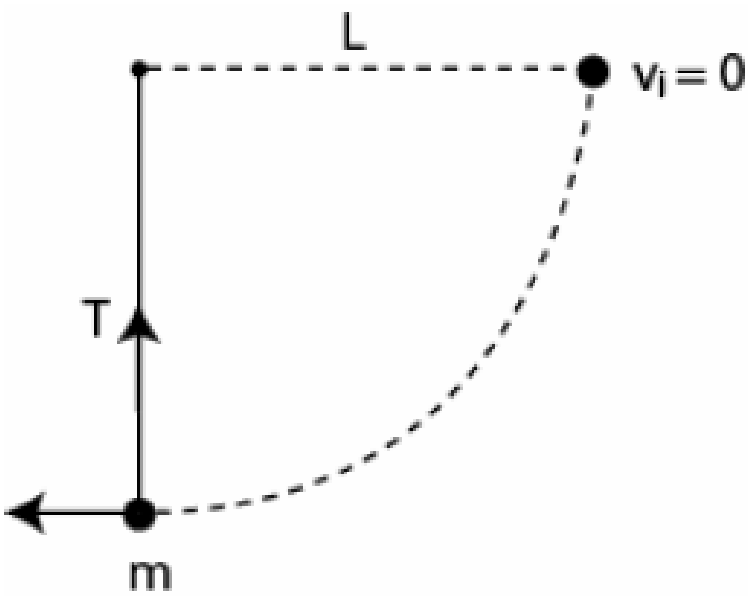
A) 2.56 m/s
B) 1.90 m/s
C) 3.64 m/s
D) 8.12 m/s
E) 5.25 m/s

Answer A

8-4 Conservation of Mechanical Energy
M2-061

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?

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



Answer C

8-4 Conservation of Mechanical Energy
M2-061

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

Answer B

8-4 Conservation of Mechanical Energy
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) 1840 N/m
B) 980 N/m
C) 490 N/m
D) 1250 N/m
E) 2800 N/m

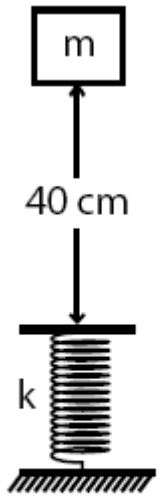


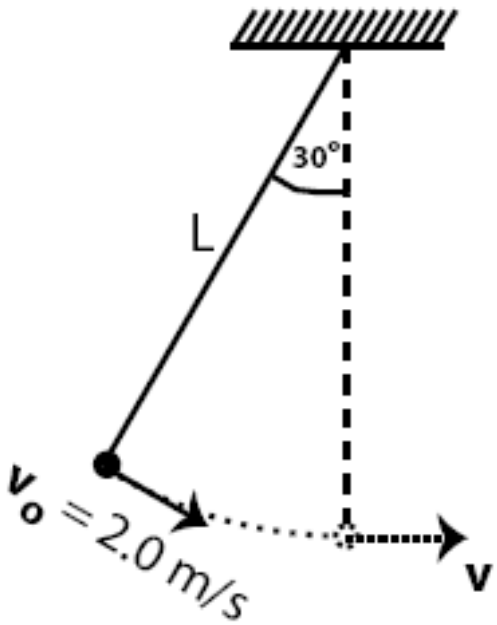
Figure 2

Answer A

8-4 Conservation of Mechanical Energy
M2-042

Fig 1 shows a pendulum of length L = 1.0 m. Its ball has speed of vo=2.0 m/s when the cord makes an angle of 30 degrees with the vertical. What is the speed (V) of the ball when it passes the lowest position?

A) 5.2 m/s
B) 3.8 m/s
C) 4.4 m/s
D) 2.6 m/s
E) 1.4 m/s



Answer D

8-4 Conservation of Mechanical Energy
M2-032

A projectile of mass 0.20 kg is fired with an initial speed of 20 m/s at an angle of 60 degrees above the horizontal. The kinetic energy of the projectile at its highest point is:

A) 0 J
B) 40 J
C) 30 J
D) 5.0 J
E) 10 J

Answer E

8-4 Conservation of Mechanical Energy
M2-032

The simple pendulum shown in Fig 1 is released from rest at point (A) which is 0.5 m above its lowest point (B). The speed of the ball at (B) is:

A) 20 m/s
B) 4.2 m/s
C) 5.8 m/s
D) 3.1 m/s
E) 0 m/s

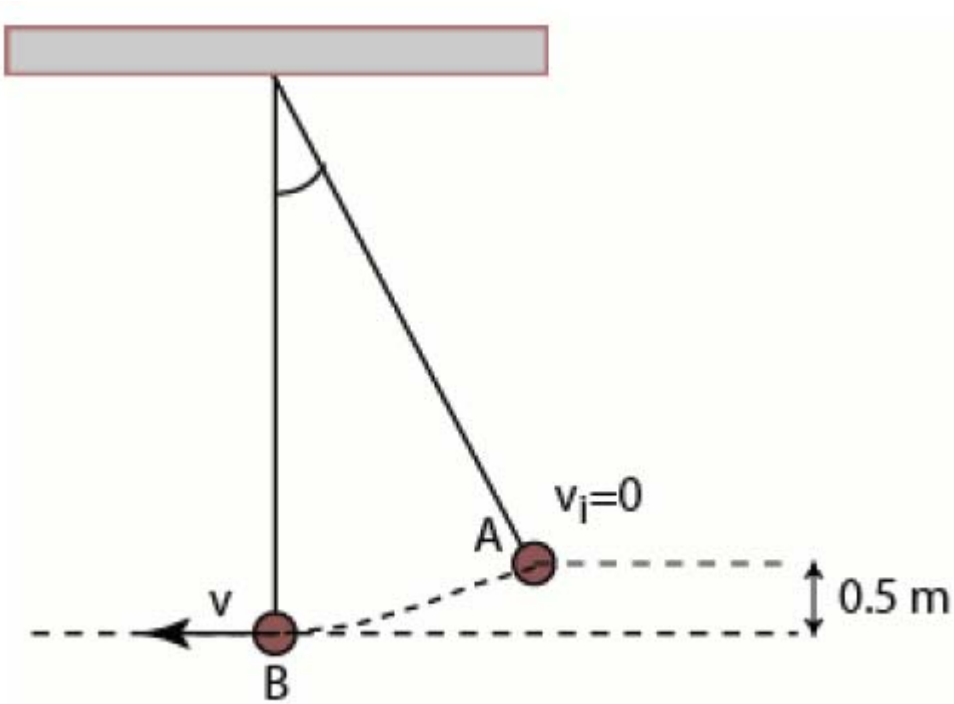


Figure 1

Answer D

8-6 Conservation of Energy
M2-061

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

Answer E

8-6 Conservation of Energy
M2-042

A 6.0 kg box starts up a 30 degrees incline with 158 J of kinetic energy. How far will it slide up the incline if the coefficient of kinetic friction between box and incline is 0.40 ?

A) 5.2 m
B) 2.2 m
C) 1.2 m
D) 4.2 m
E) 3.2 m

Answer E

8-6 Conservation of Energy
M2-042

To pull a 100 kg object across a horizontal frictionless floor, a worker applies a force of 220 N, directed 60 degrees above the horizontal. As the object moves 5.0 m, what is the work done on the object?

A) 550 J
B) 500 J
C) 400 J
D) 600 J
E) 650 J

Answer A

8-6 Conservation of Energy
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) 0.23 m
B) 0.39 m
C) 0.44 m
D) 0.13 m
E) 0.56 m

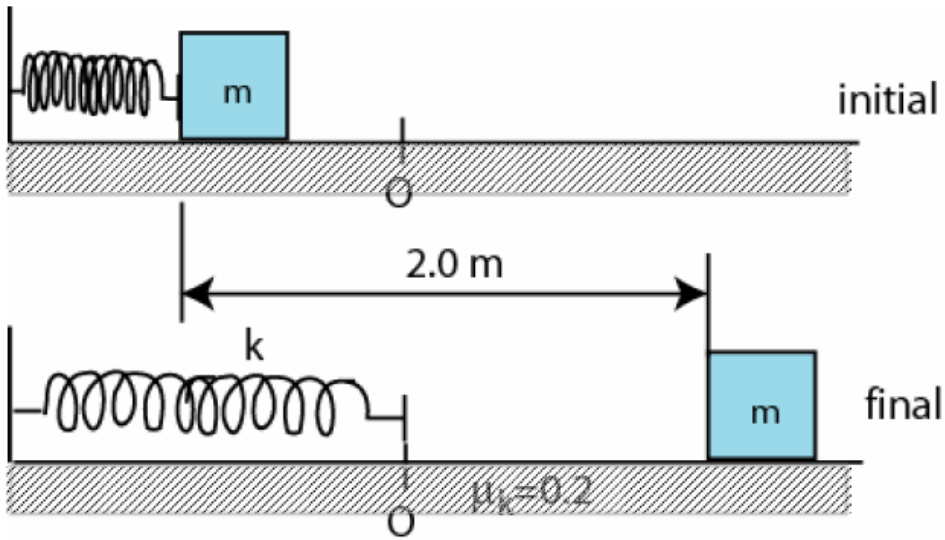


Figure 1

Answer C

8-6 Conservation of Energy
M2-041

A 75 kg parachutist releases himself off a tower that is 85 m high. Assume that he starts from rest and reaches the ground with a speed of 5.0 m/s. How much work was done by the nonconservative forces on him?

A) -3.2×10^5 J
B) -6.2×10^4 J
C) -4.5×10^4 J
D) -9.8×10^4 J
E) -4.5×10^5 J

Answer B

8-6 Conservation of Energy
M2-032

A 2.0 kg block starts from rest on a rough inclined plane that makes an angle of 30 degrees with the horizontal. The coefficient of kinetic friction is 0.20. As the block moves 2.0 m down the plane, the change in gravitational potential energy of the block is:

A) – 29.4 J
B) 0 J
C) - 9.8 J
D) - 19.6 J
E) - 39.2 J

Answer D

8-6 Conservation of Energy
M2-032

A 0.50 kg block attached to a spring with a spring constant of 100 N/m moves on a horizontal surface having a coefficient of kinetic friction 0.3 (see Fig 2). The spring is initially compressed by 10 cm from the unstretched position O and then released from rest. The speed of the block when it passes through the point O is:

A) 1.2 m/s
B) 3.2 m/s
C) 5.5 m/s
D) 7.8 m/s
E) 1.4 m/s

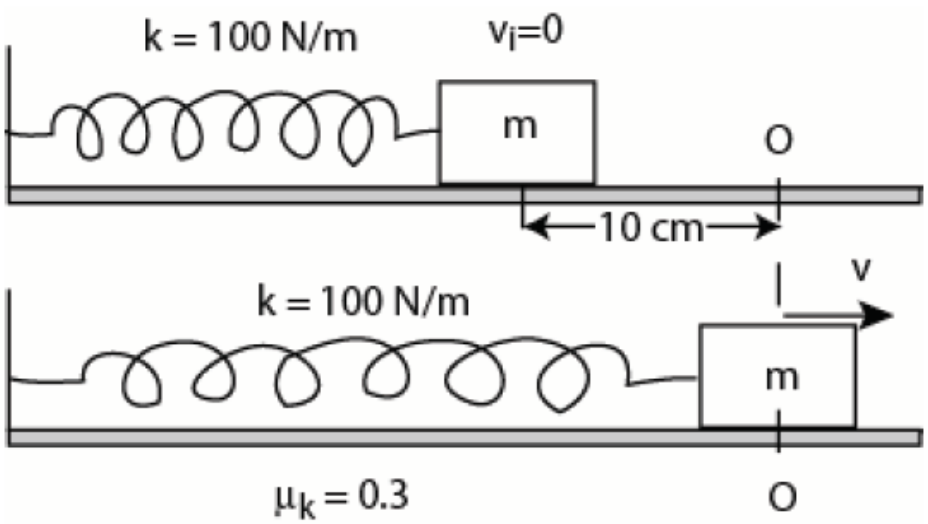


Figure 2

Answer A

8-6 Conservation of Energy
M2-032

A 10 gram bullet is shot in the +x-direction with a speed of Vo = 500 m/s into a stationary block of wood that has a mass of 5.0 kg (see Fig 3). The bullet embeds itself in the block. What distance (d) will the block slide on a surface having a coefficient of kinitic friction equal to 0.5?

A) 2 cm
B) 50 cm
C) 100 cm
D) 5 cm
E) 10 c

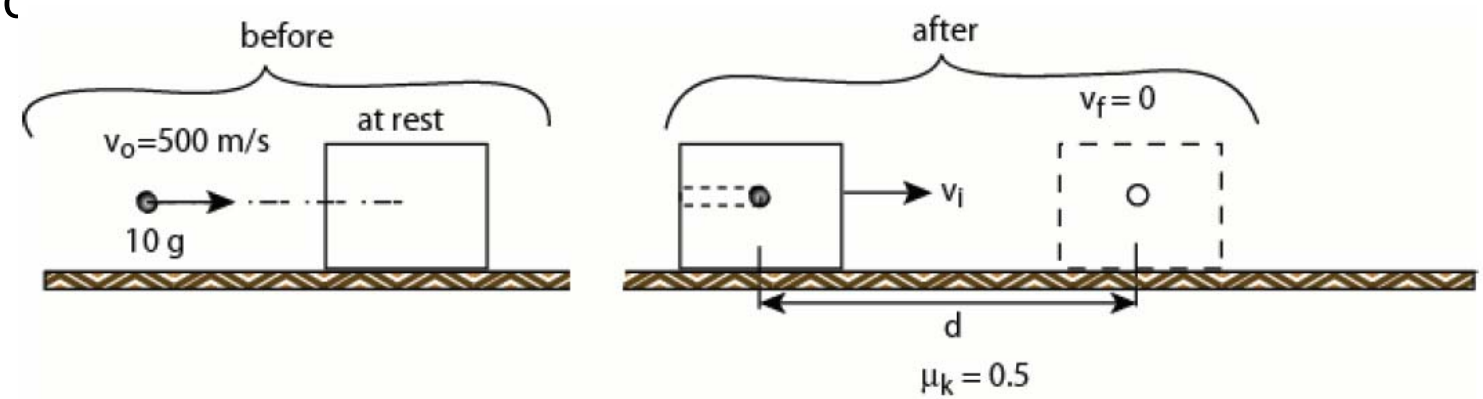


Figure 3

Answer E