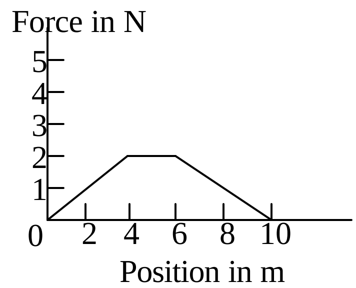
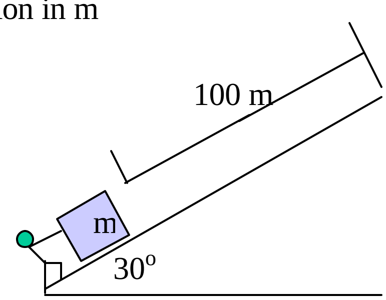
5-1A. A 7 kg block moves in a straight line under the influence of a force that varies with position as shown in the figure at the right. If the force is directed along the direction of motion, how much work is done by this force as the block moves from the origin to x = 10 m?
(a) 700 J (b) 70 J (c) 12 J (d) 20 J (e) 10 J

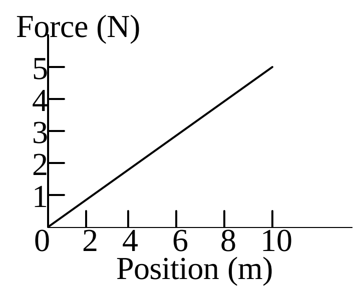


5-2A. A woman weighing 50 N walks up 120 stairs, each of height 0.25m. How much work does she do against gravity?
(a) 1500 J (b) 24,000 J (c) 0.1 J (d) 6000 J (e) None of these is close.

5-3A. A person pushed a 50 kg mass a distance of 100 m along a 30^o frictionless incline as shown at the right. How much work did the person do?
(a) $+2.5x10^3$J (b) $+5x10^4$J (c) $+2.5x10^4$J (d) $+5x10^3$J (e) $-5x10^3$J.

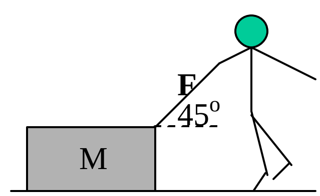


5-4A. A worker pushes a wheelbarrow with a force of 50 N over a level distance of 5.0 m. If a frictional force of 43 N acts on the wheelbarrow in a direction opposite to that of the worker, what net work is done on the wheelbarrow?
(a) 250 J (b) 215 J (c) 35 J (d) 10 J (e) None of these is close.

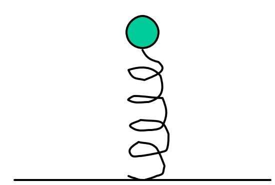


5-5A. The figure at the right shows the force as a function of position x acting on a 30 kg mass. The work that this force does on the body between x = 0 m and x = 10 m is about:
(a) 50 J (b) 3 J (c) 25 J (d) 30 J (e) 500 J

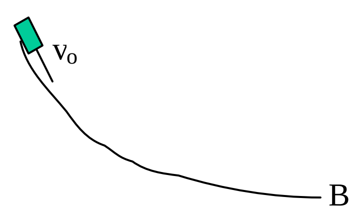
5-6A. As shown in the figure at the right, a person pulls on a 5 kg block with a force F = 14 Nt directed 45^o above the horizontal. If the coefficient of friction between the block and the ground is 0.1, how much work does the person do in moving the block through a horizontal distance of 5 m?
(a) 25 J (b) 30 J (c) 15 J (d) 50 J (e) None of these.



5-7A. In the figure at the right, a stone of mass 5 kg is at rest on a spring, having caused the spring to compress by 20 cm from its unstretched length. If the stone is removed, and the spring is now compressed by 60 cm from its unstretched length, what potential energy is then stored in the spring?
(a) 45 J (b) 20 J (c) 30 J (d) 2 J (e) 4.5 J.

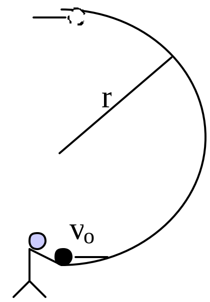


5-8A. A block with initial speed v_o slides down a curved ramp as shown at the right. Which one of the following statements is WRONG?
(a) If there is friction, the speed of the block at the bottom B will depend upon the shape of the curve
(b) If there is no friction, the speed of the block at the bottom B will be independent of the shape of the curve.
(c) The block cannot slide down the ramp if there is no friction.
(d) The block can slide down the ramp if there is friction.
(e) If friction is weak, the block may speed up as it slides.



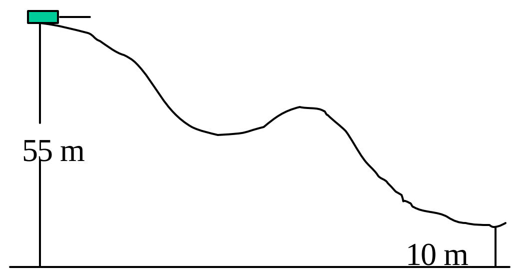
5-9A. Which one of the following statements is WRONG?
(a) Doubling the speed of an object makes its kinetic energy four times larger.
(b) A force that slows down a moving object, does negative work on the slowing object.
(c) The kinetic energy of a body depends upon the speed of motion of the reference frame in which the kinetic energy is measured.
(d) A force exerted perpendicular to the motion of a particle does no work on that particle as it moves.
(e) A car stops from a speed of 50 mph by braking so that the car slows with constant deceleration. Neglecting air friction, the work done on the car by friction with the ground depends upon the magnitude of this deceleration.

5-10A. A person throws a ball of mass 2 kg horizontally with speed v_o = 10 m/s into the bottom of a frictionless, vertical semicircle of radius r = 0.9 m as shown at the right. If v_o is large enough so that the ball stays on the semicircle, with about what speed v does the ball leave the semicircle?
(a) 10 m/s (b) 8 m/s (c) 6 m/s (d) 9 m/s (e) 5 m/s



5-11A. Which one of the following statements is WRONG?
(a) A conservation law for an isolated system can always be expressed as X = constant, where X is the property that is "conserved".
(b) The potential energy of the gravitational force near the earth's surface is "mgy", where y is the height above a reference location.
(c) The potential energy stored in a spring of force constant k that has been compressed a distance x from equilibrium is $(1/2)kx^2$.
(d) A potential energy can be defined for a frictional force F in the form Fx, where x is the distance from a chosen reference point.
(e) If a block of mass m, attached to a massless spring, oscillates back and forth on a horizontal frictionless floor, then the mechanical energy E of the system of block and spring remains constant, but is shunted continuously back and forth between kinetic energy of the mass and potential energy of the spring.

5-12A. A 50 kg cart on a roller coaster is released from rest at a height of 55 m above the ground. If the roller coaster is frictionless, about what will be the cart's speed at a height of 10 m above the ground?
(a) 30 m/s (b) 33 m/s (c) 50 m/s (d) 9.5 m/s (e) None of these

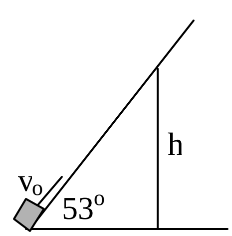


5-13A. Here are three statements:
(A) A force is conservative if the work it does on a particle that moves through a round trip is zero; otherwise it is nonconservative.
(B) A force is conservative if the work done by it on a particle that moves between two points is the same for all paths connecting those points; otherwise it is nonconservative.
(C) A potential energy can only be defined for a conservative force.
Which one of the following answers is completely correct?
(a) A, B, and C are all correct statements. (b) A and B are correct statements, but C is wrong.
(c) A and B are wrong statements, but C is correct. (d) A and C are correct statements, but B is wrong.
(e) B and C are correct statements, but A is wrong.

5-14A. One horsepower equals 746 W. How many 24 kg (weight almost 53 lbs) masses would you have to lift onto a 1 m high table in 2 minutes to produce an average power output of 1 horsepower over this time?
(a) 373 (b) 37.3 (c) 746 (d) 3.1 (e) 186.5

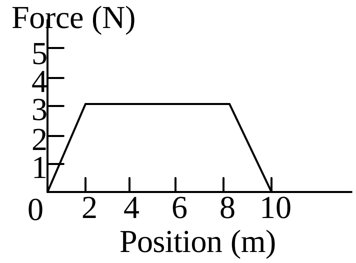
5-15A. In 60 seconds, you lift twenty 6 kg bricks from the ground to the top of a 1 m high table. What is your average power output?
(a) 2 W (b) 20 W (c) 360 W (d) 7200 W (e) You don’t have enough information to tell.

5-16A. A mass m = 10 kg is projected up a 53° ramp with initial speed v_o = 10 m/s. If it is subject to a constant friction force of 20 N, to what maximum height h does it rise?
(a) 10 m (b) 4.2 m (c) 6.6 m (d) 4.0 m (e) 2.0 m

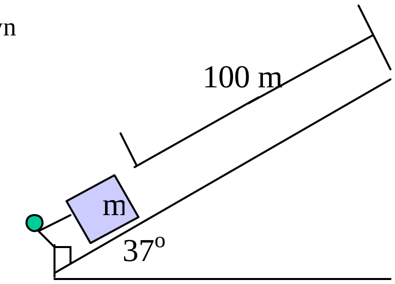


5-17A A particle of mass 10 kg, starting from rest, has an amount of work done on it that gives it a final speed of 5 m/s. If, instead, twice as much work had been done on it, its final speed would have been about:
(a) 5 m/s (b) 10 m/s (c) 25 m/s (d) 3 m/s (e) 7 m/s

5-1B. A 10 kg block moving in a straight line is slowed down by a force that varies with position as shown in the figure at the right. If the force is directed opposite to the direction of motion, how much work is done by this force as the block moves from the origin to x = 10 m?
(a) -70 J (b) -30 J (c) -12 J (d) -24 J (e) -300 J

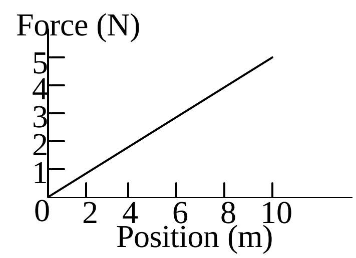


5-2B. A woman weighing 50 N walks up 120 stairs, each of height 0.25m and then back down 60 stairs. How much net work does she do against gravity?
(a) 2250 J (b) 1500 J (c) 750 J (d) 6000 J (e) None of these is close.

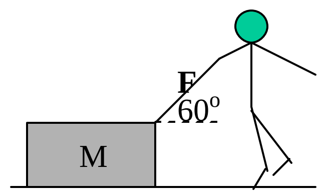


5-3B. A person pushed a 25 kg mass a distance of 100 m along a 37° frictionless incline as shown at the right.
How much work did the person do?
(a) $+7.5\times10^3$ J (b) $+3\times10^4$ J (c) $+3\times10^4$ J (d) $+1.5\times10^4$ J (e) 1.5×10^3 J

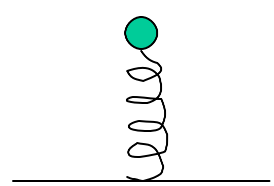
5-4B. A worker pushes a wheelbarrow with a force of 20 N over a level distance of 25 m. If a frictional force of 10 N acts on the wheelbarrow in a direction opposite to that of the worker, what net work is done on the wheelbarrow?
(a) 250 J (b) 215 J (c) 35 J (d) 10 J (e) None of these is close



5-5B. The figure at the right shows the force as a function of distance x acting on a 30 kg mass. The work that this force does on the body between x = 4 m and x = 10 m is about:
(a) 50 J (b) 42 J (c) 25 J (d) 30 J (e) 21 J

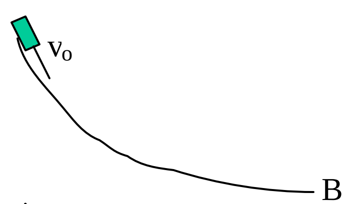


5-6B. As shown in the figure at the right, a person pulls on a 5 kg block with a force F = 10 N directed 60° above the horizontal. If the coefficient of friction between the block and the ground is 0.1, how much work does the person do in moving the block through a horizontal distance of 5 m?
(a) 25 J (b) 30 J (c) 15 J (d) 50 J (e) None of these.



5-7B. In the figure at the right, a stone of mass 10 kg is at rest on a spring, having caused the spring to compress by 20 cm from its unstretched length. If the stone is removed, and the spring is now compressed by 60 cm from its unstretched length, what potential energy is then stored in the spring?
(a) 45 J (b) 9 J (c) 4 J (d) 18 J (e) 90 J.

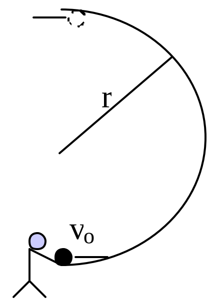
5-8B. A block with initial speed v_o slides down a curved ramp as shown at the right. Which one of the following statements is CORRECT?



(a) If there is friction, the speed of the block at the bottom B will be independent of the shape of the curve.
(b) If there is no friction, the speed of the block at the bottom B will be independent of the shape of the curve.
(c) The block can't slide down the ramp if there is no friction.
(d) The block can only slide down the ramp if there is no friction.
(e) If there is friction, the block must slow down as it slides, no matter how weak the friction.

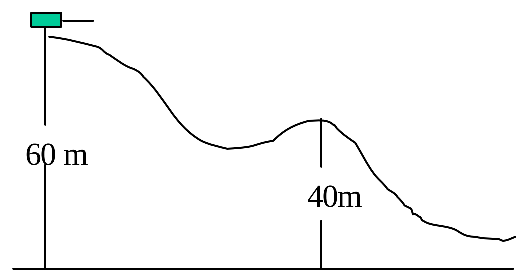
5-9B. Which one of the following statements is WRONG?
(a) Doubling the speed of an object makes its kinetic energy four times larger.
(b) A force that slows down a moving object, does negative work on the slowing object.
(c) The kinetic energy of a body depends upon the speed of motion of the reference frame in which the kinetic energy is measured.
(d) A force exerted perpendicular to the motion of a particle does work on that particle as it moves.
(e) A car stops from a speed of 50 mph by braking so that the car slows with constant deceleration. Neglecting air friction, the work done on the car by friction with the ground is independent of the magnitude of this deceleration.

5-10B. A person throws a ball of mass 2 kg horizontally with speed v_o = 12 m/s into the bottom of a frictionless, vertical semicircle of radius r = 1.1 m as shown at the right. If v_o is large enough so that the ball stays on the semicircle, with about what speed v does the ball leave the semicircle?
(a) 10 m/s (b) 8 m/s (c) 6 m/s (d) 11m/s (e) 8.8 m/s



5-11B. Which one of the following statements is WRONG?
(a) A conservation law for an isolated system can always be expressed as X = constant, where X is the property "conserved".
(b) The potential energy of the gravitational force near the earth's surface has the form "mgy", where y is the height above a chosen reference location.
(c) The potential energy stored in a spring of force constant k that has been compressed a distance x from equilibrium is (1/2)kx.
(d) A potential energy cannot be defined for a frictional force F.
(e) If a block of mass m, attached to a massless spring, oscillates back and forth on a horizontal frictionless floor, then the mechanical energy E of the system of block and spring remains constant, but is shunted continuously back and forth between kinetic energy of the mass and potential energy of the spring.

5-12B. A 50 kg cart on a roller coaster is released with a speed of 9 m/s at a height of 60 m above the ground. If the roller coaster is frictionless, about what will be the cart's speed at a height of 40 m above the ground?
(a) 22 m/s (b) 18 m/s (c) 44 m/s (d) 10 m/s (e) None of these is close.

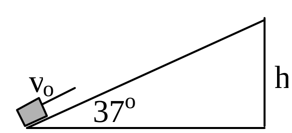


5-13B. Here are three statements:
(A) A force is conservative if the work it does on a particle that moves through a round trip is zero; otherwise it is nonconservative.
(B) A force is conservative if the work done by it on a particle that moves between two points is the same for all paths connecting those points; otherwise it is nonconservative.
(C) A potential energy can be defined for any force.
Which one of the following answers is completely correct?
(a) A, B, and C are all correct statements. (b) A and B are correct statements, but C is wrong.
(c) A and B are wrong statements, but C is correct. (d) A and C are correct statements, but B is wrong.
(e) B and C are correct statements, but A is wrong.

5-14B. One horsepower equals 746 W. About how many times would you have to bench press a 60 kg (weight about 132 lbs) mass a distance of 0.75 m in 2 minutes to produce an average power output of 1 horsepower over this time?
(a) 0.3 (b) 20 (c) 500 (d) 2000 (e) 200

5-15B. Water flows over a section of Niagara Falls at the rate of 1.2 x 10^6 kg/s and falls 50 m. About how many Megawatts of power are generated by the falling water?
(a) 6 (b) 60 (c) 600 (d) 6000 (e) 60,000

5-16B. A mass m = 10 kg is projected up a 37^o ramp with initial speed v_o = 10 m/s. If it is subject to a constant friction force of 30 N, to what maximum height h does it rise?
(a) 10 m (b) 3.3 m (c) 6.6 m (d) 3.6 m (e) 2.0 m



5-17B A particle of mass 10 kg, starting from rest, has an amount of work done on it that gives it a final speed of 5 m/s. If, instead, four times as much work had been done on it, its final speed would have been about:
(a) 5 m/s (b) 10 m/s (c) 25 m/s (d) 3 m/s (e) 7 m/s

5-1A) c 2A) a 3A) c 4A) c 5A) c 6A) d 7A) a 8A) c 9A) e 10A) b 11A) d 12A) a 13A) a 14A) a 15A) b
16A) d 17A) e

5-1B) d 2B) c 3B) d 4B) a 5B) e 6B) a 7B) e 8B) b 9B) d 10B) a 11B) c 12B) a 13B) b 14B) e 15B) c
16B) b 17B) b