11 Energy

1. Rae Ann weighs 530 N. What is her kinetic energy as she swims at a speed of 1.2 m/s?

2. In a hardware store, paint cans, which weigh 46 N each, are transported from storage to the back of the paint department by placing them on a 24°-ramp. The cans slide down the ramp at a constant speed of 3.4 m/s onto a table made of the same material as the ramp. How far does each can slide on the table?

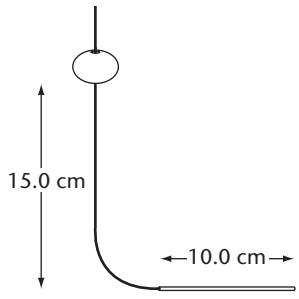
3. Zeke begins to slide down a snow hill on a rubber mat. Zeke's mass is 76 kg and that of the mat is 2 kg.

a. What is the change in the gravitational potential energy of Zeke and the mat when they are 1.2 m below the crest?

b. Disregarding frictional forces, what is the change in the kinetic energy of Zeke and the mat when they are 1.2 m below the crest?

c. Disregarding frictional forces, how fast are they moving when they are 1.2 m below the crest?

4. Kim is playing with a bead that slides on a wire as shown below.



The wire and bead are frictionless but the white sheathing exerts a constant frictional force on the 5.0-g bead.

a. When the bead is dropped as shown, it comes to rest 6.0 cm along the white sheathing. How much work does the white sheathing do on the bead?

b. From what height should the bead be dropped so it stops at the end of the white sheathing?

6. Running at 4.0 m/s, Rafael grabs a vertical rope and swings upward. Assuming that air resistance is negligible, how far does Rafael rise?

7. A coiled spring gives a block of wood a kinetic energy of 1.50 J. The block slides up a ramp to a height that is 0.880 the height predicted using the conservation of mechanical energy.

a. Plot graphs showing the gravitational potential energy and kinetic energy of the brick at the bottom of the incline and at the point where it comes to rest.

b. How much mechanical energy was lost?

8. Erin raises the 1.20-kg bob of a pendulum to a level at which its gravitational potential energy is 3.00 J.

a. Predict the speed of the bob as it passes through its lowest point.

b. Erin releases the bob from rest and uses a photogate to measure its speed as it passes through its lowest point. She finds that the speed is 93.2% of the predicted value. How much work did frictional forces do on the pendulum?

c. The pendulum's original energy was decreased by what percentage due to the work done by frictional forces on the pendulum as it moved from its release point through its lowest point?

9. Steve can consistently throw a 0.200-kg ball at a speed of 12.0 m/s. On one throw the ball passes the top of a flagpole, which is 6.00 m above the ball's initial position.

a. What is the ball's gravitational potential energy when it passes the top of the flagpole? (Assume the ball's initial gravitational energy is 0 J).

b. What is the ball's kinetic energy as it passes the top of the flagpole?

c. Steve throws the ball straight upward. What is the ball's velocity as it first passes the top of the flagpole?

d. Steve throws the ball at a speed of 12.0 m/s so that it just reaches the top of the flagpole. What is the ball's velocity at the top of the flagpole?

e. For question 9 d, what is the ball's initial velocity?

10. A skateboarding area has two ramps. The first ramp has a height of 0.30 m and the second a height of 0.60 m. A 2.0-kg skateboard is released from rest at the top of the first ramp and rolls down the ramp onto the level ground. There a 47-kg skateboarder jumps on it and rides it up the second ramp. With what horizontal velocity must the skateboarder mount the skateboard as it moves on the level so that the board just reaches the top of the second ramp? (Assume that frictional forces on the skateboard wheels are negligible.)