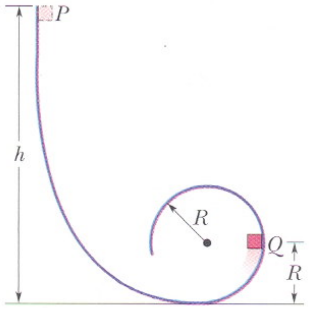
Ch8

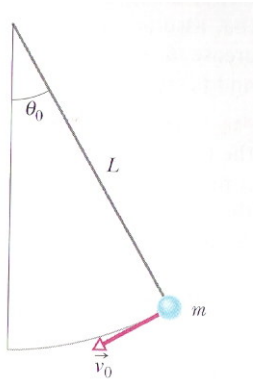
7

In the figure shown, a small block of mass m= 0.032 kg can slide along the frictionless loop-the-loop, with radius R= 12 cm. The block is released from rest at point P, at height h = 5.0 R above the bottom of the loop. How much work does the gravitational Force do on the block as the block travels from point P to (a) point Q and (b) the top of the loop? If the gravitational potential energy of the block-earth system is taken to be zero at the bottom of the loop, what is that potential energy when the block is at (c) point P, (d) at point Q, and (e) at the top of the loop? (f) If, instead of merely being released, the block is given some initial speed downward along the track, do the answers to (a) through (e) increase, decrease, or remain the same?

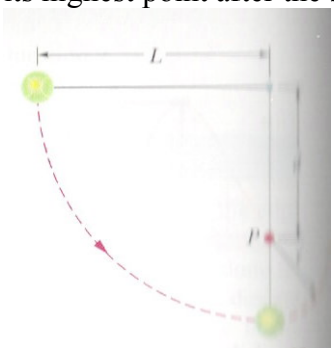


8

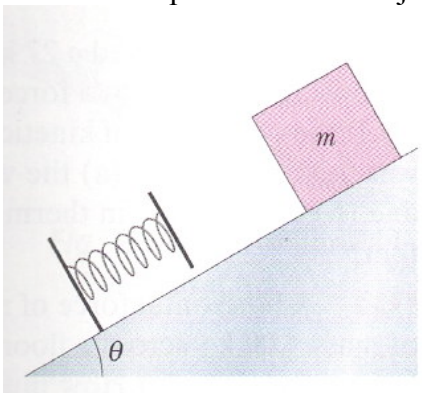
The figure shows a thin rod of length L = 2.00 m and negligible mass, that can pivot about one end to rotate in a vertical circle. A ball of mass m = 5.00 kg is attached to the other end. The rod is pulled aside to angle θ = 30.0º and released with initial velocity V_0=0. As the ball descends to its lowest point, (a) how much work does the gravitational force do on it and (b) what is the change in the gravitational potential energy of the ball-earth system? (c) If the gravitational potential energy is taken to be zero at the lowest point, what is the value just as the ball is released? (d) Do the magnitudes of the answers to (a) through (c) increase, decrease, or remain the same if angle θ is increased?



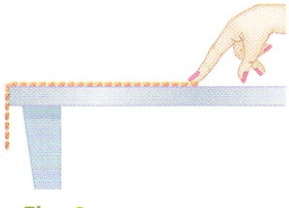
23
The string in the figure is L = 120 cm long, has a ball attached to one end, and is fixed at its other end. The distance d from the fixed end to a fixed peg at point P is 75.0 cm. When the initially stationary ball is released with the string horizontally as shown, it will swing along the dashed arc. What is its speed when it reaches (a) its lowest point and (b) its highest point after the string catches on the peg?



29
In the figure, a block of mass m = 12 kg is released from rest on a frictionless incline of angle θ = 30.0º. Below the block is a spring that can be compressed 2.0 cm by a Force of 270 N. The block momentarily stops when it compresses the spring by 5.5 cm. (a) How far does the block move down the incline from its rest position to this stopping point? (b) What is the speed of the block just as it touches the spring?



70
A chain is held on a frictionless table with one-fourth of its length hanging over the edge. If the chain has length L = 28 cm and mass m = 0.012 kg, how much work is required to pull the hanging part back onto the table?



85
A locomotive with a power capability of 1.5 MW can accelerate a train fro, a speed of 10 m/s to 25m/s in 6.0min. (a) Calculate the mass of the train. Find (b) the speed of the train and (c) the force accelerating the train as functions of time (in seconds) during the 6.0 min interval. (d) Find the distance moved by the train during the interval.

135

The magnitude of the gravitational force between a particle of mass m_1 and one of mass m_2 is given by $F(x) = G(m_1m_2)/x^2$, where G is a constant and x is the distance between the particles. (a) What is the corresponding potential energy function U(x)? Assume that $U(x) \rightarrow 0$ as $x \rightarrow \infty$ and that x is positive. (b) How much work is required to increase the separation of the particles from $x = x_1$ to $x = x_1 + d$?