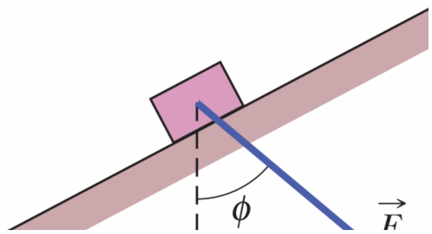
Ch7

••22 A cave rescue team lifts an injured spelunker directly upward and out of a sinkhole by means of a motor-driven cable. The lift is performed in three stages, each requiring a vertical distance of 10.0 m: (a) the initially stationary spelunker is accelerated to a speed of 5.00 m/s; (b) he is then lifted at the constant speed of 5.00 m/s; (c) finally he is decelerated to zero speed. How much work is done on the 80.0 kg rescuee by the force lifting him during each stage?



suppose $g = 10 m/s^2$

(a) $\frac{V_t^2 - V_0^2}{2a} = x$, $a = \frac{V_t^2 - V_0^2}{2x} = \frac{25}{20} = 1.25 m/s^2$

$F_1 = mg + ma = 80 \times 10 + 80 \times 1.25 = 900N$

$W_1 = F_1 \cdot h = 900N \times 10 m = 9000J$

(b) $F_2 = mg = 80 \times 10 = 800 N$

$W_2 = F_2 \cdot h = 8000J$

(c) $F_3 = mg + ma = 80 \times 10 + 80 \times (-1.25) = 700N$

$W_3 = F_3 \cdot h = 700N \times 10m = 7000J$.

Ch7

•43 **SSM** A force of 5.0 N acts on a 15 kg body initially at rest. Compute the work done by the force in (a) the first, (b) the second, and (c) the third seconds and (d) the instantaneous power due to the force at the end of the third second.

(a) $a = \frac{F}{m} = \frac{1}{3}\ m/s^2$

$\Delta x_1 = \frac{1}{2}at^2 = \frac{1}{6}\ m$, $W_1 = F \cdot \Delta x_1 = \frac{5}{6}\ J$

(b) $\Delta x = \frac{1}{2}a(2t)^2 = \frac{2}{3}\ m$, $\Delta x_2 = \Delta x - \Delta x_1 = \frac{1}{2}\ m.$

$W_2 = F \cdot \Delta x_2 = 2.5\ J$

(c) $\Delta x = \frac{1}{2}a(3t)^2 = \frac{3}{2}\ m$, $\Delta x_3 = \Delta x - \Delta x_1 - \Delta x_2 = \frac{5}{6}\ m$

$W_3 = F \cdot \Delta x_3 = \frac{25}{6}\ J$

(d) $V_t = at = \frac{1}{3} \times 3 = 1\ m/s$

$P = F \cdot V_t = 5.0\ W$

Ch8

••6 In Fig. 8-33, a small block of mass $m = 0.032$ kg can slide along the frictionless loop-the-loop, with loop radius $R = 12$ cm. The block is released from rest at point P, at height $h = 5.0R$ 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 (c) at 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?

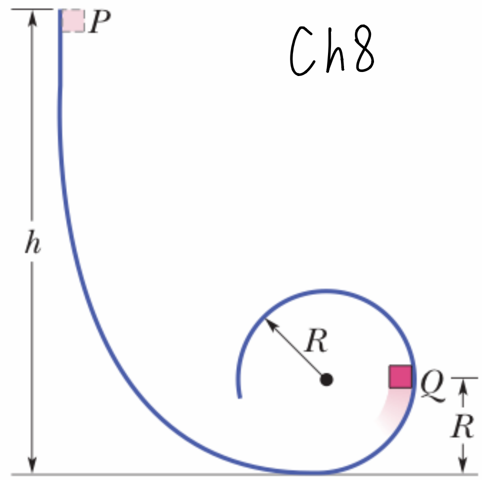


Figure 8-33 Problems 6 and 17.

(a) Suppose that $g = 10\,m/s^2$.

$\Delta W_1 = mg \cdot \Delta h_1 = 0.032 \times 10 \times (h - R)$

$= 1.28R = 1.28 \times 12 \times 10^{-2} = 0.1536J$

(b) $\Delta W_2 = mg \cdot \Delta h_2 = 0.032 \times 10 \times (h - 2R)$

$= 0.96R = 0.96 \times 12 \times 10^{-2} = 0.1152J$

(c) $P_p = -\Delta W_3 = -(-mg \cdot h) = mgh$

$= 0.032 \times 10 \times 5 \times 12 \times 10^{-2} = 0.192J$

(d) $P_Q = -(-mg \cdot R) = mgR$

$= 0.032 \times 10 \times 12 \times 10^{-2} = 0.0384J$

(e) $P_t = -(-mg \cdot 2R) = 2mgR = 0.0768J$

Ch8

••57 GO In Fig. 8-54, a block slides along a track from one level to a higher level after passing through an intermediate valley. The track is frictionless until the block reaches the higher level. There a frictional force stops the block in a distance d. The block's initial speed v_0 is 6.0 m/s, the height difference h is 1.1 m, and μ_k is 0.60. Find d.

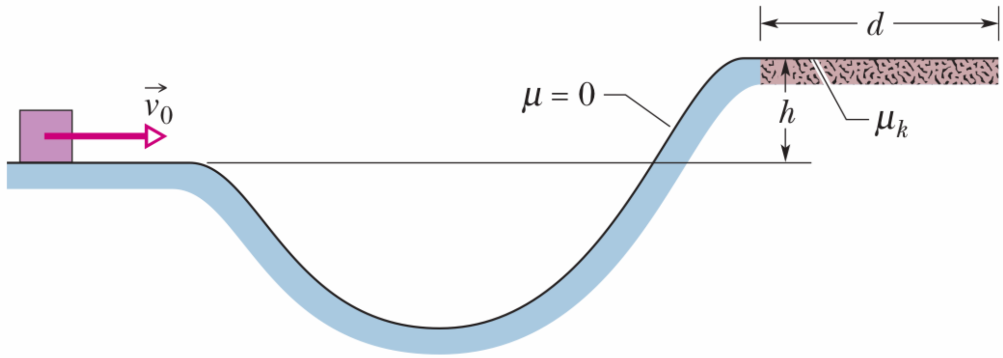


Figure 8-54 Problem 57.

Suppose $g = 10\,m/s^2$

$W_0 = \frac{1}{2}mv_0^2 = 18m$

$\Delta W_1 = mg \cdot \Delta h = 11m$

$\Rightarrow W_0 - \Delta W_1 = \mu_k N d$

$d = \dfrac{W_0 - \Delta W_1}{\mu_k N}$

$N = mg = 10m$

So we get $d = \frac{7}{6}m$

••5 GO What are (a) the x coordinate and (b) the y coordinate of the center of mass for the uniform plate shown in Fig. 9-38 if $L = 5.0$ cm?

Figure

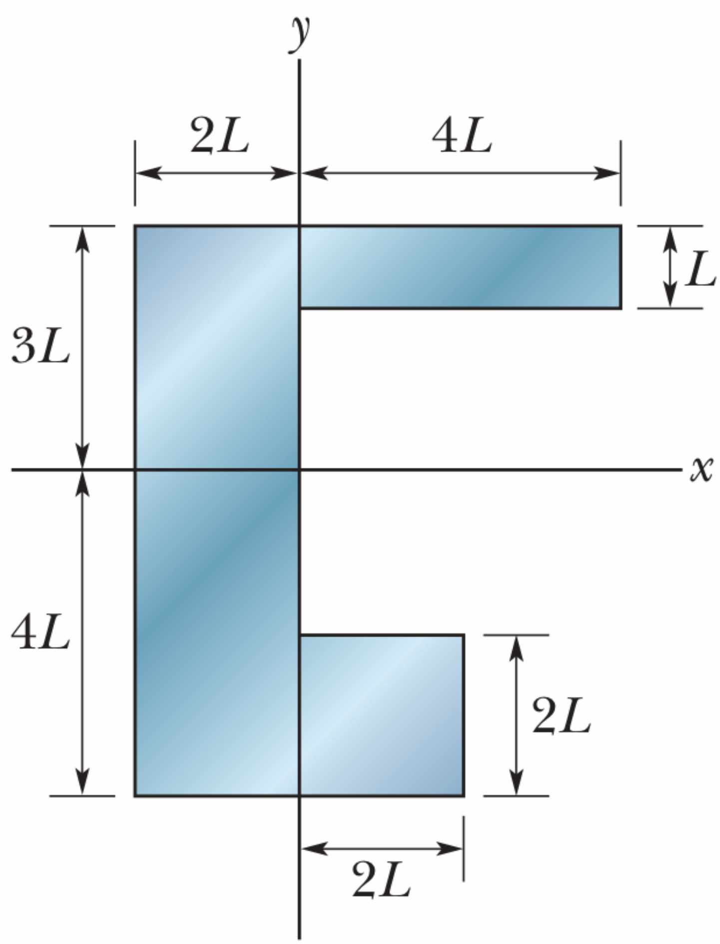


Figure 9-38 Problem 5.