Assignment 7

PHY1001

NO LATE SUBMISSION IS ACCEPTED

22 A 70 kg skier starts from rest at height $H = 22$ m above the end of a ski-jump ramp (Fig. 8-25) and leaves the ramp at angle $\theta = 28°$. Neglect the effects of air resistance and assume the ramp is frictionless. (a) What is the maximum height h of his jump above the end of the ramp? (b) If he increased his weight by putting on a backpack, would h then be greater, less, or the same?

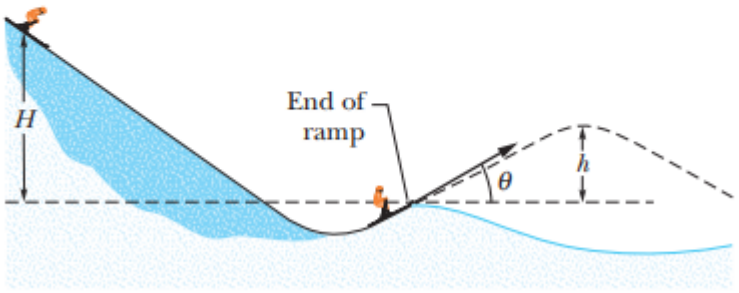

Figure 8-25 Problem 22.

30 A 2.0 kg breadbox on a frictionless incline of angle $\theta = 40°$ is connected, by a cord that runs over a pulley, to a light spring of spring constant $k = 105$ N/m, as shown in Fig. 8-31. The box is released from rest when the spring is unstretched. Assume that the pulley is massless and frictionless. (a) What is the speed of the box when it has moved 10 cm down the incline? (b) How far down the incline from its point of release does the box slide before momentarily stopping, and what are the (c) magnitude and (d) direction (up or down the incline) of the box's acceleration at the instant the box momentarily stops?

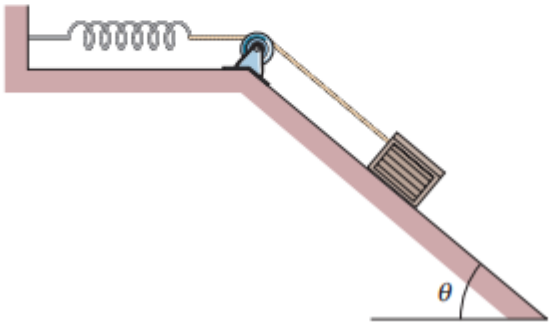

Figure 8-31 Problem 30.

31 As shown in Fig. 8-32, the right end of a spring is fixed to a wall. A 1.00 kg block is then pushed against the free end so that the spring is compressed by 0.25 m. After the block is released, it slides along a horizontal floor and (after leaving the spring) up an incline; both floor and incline are frictionless. Its maximum (vertical) height on the incline is 5.00 m. What are (a) the spring constant and (b) the maximum speed? (c) If the angle of the incline is increased, what happens to the maximum (vertical) height?

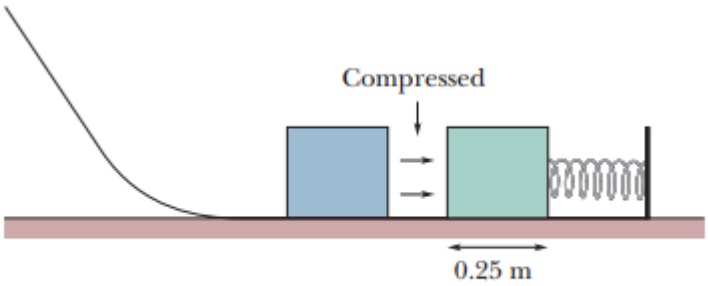

Figure 8-32 Problem 31.

32 In Fig. 8-33, a chain is held on a frictionless table with one-fourth of its length hanging over the edge. If the chain has length $L = 24$ cm and mass $m = 0.016$ kg, how much work is required to pull the hanging part back onto the table?

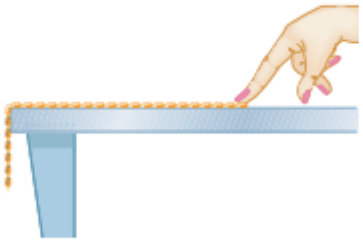

Figure 8-33 Problem 32.

43 In Fig. 8-39, a 3.5 kg block is accelerated from rest by a compressed spring of spring constant 640 N/m. The block leaves the spring at the spring's relaxed length and then travels over a horizontal floor with a coefficient of kinetic friction $\mu_k = 0.25$. The frictional force stops the block in distance $D = 7.8$ m. What are (a) the increase in the thermal energy of the block–floor system, (b) the maximum kinetic energy of the block, and (c) the original compression distance of the spring?

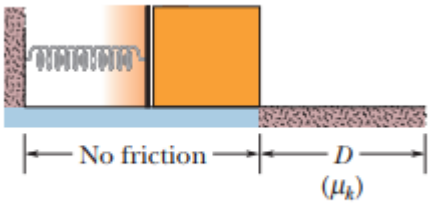

Figure 8-39 Problem 43.

50 A 60 kg skier leaves the end of a ski-jump ramp with a velocity of 27 m/s directed 25° above the horizontal. Suppose that as a result of air drag the skier returns to the ground with a speed of 22 m/s, landing 14 m vertically below the end of the ramp. From the launch to the return to the ground, by how much is the mechanical energy of the skier–Earth system reduced because of air drag?

64 In Fig. 8-46, a block is released from rest at height $d = 40$ cm and slides down a frictionless ramp and onto a first plateau, which has length d and where the coefficient of kinetic friction is 0.50. If the block is still moving, it then slides down a second frictionless ramp through height $d/2$ and onto a lower plateau, which has length $d/2$ and where the coefficient of kinetic friction is again 0.50. If the block is still moving, it then slides up a frictionless ramp until it (momentarily) stops. Where does the block stop? If its final stop is on a plateau, state which one and give the distance L from the left edge of that plateau. If the block reaches the ramp, give the height H above the lower plateau where it momentarily stops.

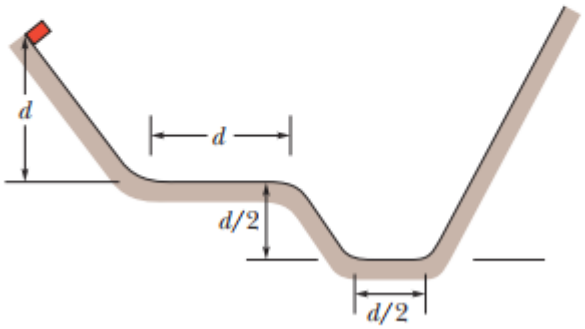

Figure 8-46 Problem 64.