

Honors Physics Work & Energy HW, part 2 (Homework)

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1.

A projectile is launched with a speed of 41 m/s at an angle of 56° above the horizontal. Find the maximum height reached by the projectile during its flight by using conservation of energy.

2.

If the wire in Problem 24 (Fig. P5.24) is frictionless between points *A* and *B* and rough between *B* and *C*, and if the 0.385 kg bead starts from rest at *A*,

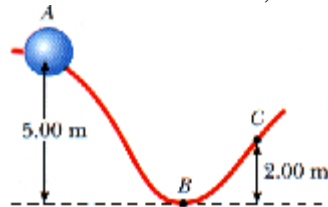


Fig. P5.24.

(a) find its speed at *B*.

(b) If the bead comes to rest at *C*, find the loss in mechanical energy as it goes from *B* to *C*.

3.

A 64 kg diver steps off a 15 m tower and drops, from rest, straight down into the water. If he comes to rest 4.4 m beneath the surface, determine the average resistance force exerted on him by the water.

4.

A 2.10×10^3 kg car starts from rest at the top of a 5.7 m long driveway that is sloped at 19° with the horizontal. If an average friction force of 4.0×10^3 N impedes the motion, find the speed of the car at the bottom of the driveway.

5.

Starting from rest, a 10.1 kg block slides 3.30 m down a frictionless ramp (inclined at 30.0° from the floor) to the bottom. The block then slides an additional 4.90 m along the floor before coming to a stop. Determine

(a) the speed of the block at the bottom of the ramp,

(b) the coefficient of kinetic friction between block and floor, and

(c) the mechanical energy lost due to friction.

6.

A skier starts from rest at the top of a hill that is inclined at 9.6° with the horizontal. The hillside is 170 m long, and the coefficient of friction between snow and skis is 0.0750. At the bottom of the hill, the snow is level and the coefficient of friction is unchanged. How far does the skier move along the horizontal portion of the snow before coming to rest?

7.

A skier of mass 61 kg is pulled up a slope by a motor-driven cable.

(a) How much work is required to pull him 70 m up a 30° slope (assumed frictionless) at a constant speed of 2.2 m/s ?

(b) How many horsepower must a motor have to perform this task?

8.

Water flows over a section of Niagara Falls at the rate of $12.8 \times 10^6 \text{ kg/s}$ and falls 45 m . How much power is generated by the falling water?

9.

A $1.50 \times 10^3 \text{ kg}$ car starts from rest and accelerates uniformly to 17.7 m/s in 11.8 s . Assume that air resistance remains constant at 400 N during this time. Find

(a) the average power developed by the engine and

(b) the instantaneous power output of the engine at $t = 11.8 \text{ s}$.

10.

While running, a person dissipates about 0.60 J of mechanical energy per step per kilogram of body mass. If a 55 kg person develops a power of 77 W during a race, how fast is the person running?

Assume that a running step is 1.5 m long.