Answer on Question #43399-Physics-Mechanics-Kinematics-Dynamics

A spring is compressed by a 5.60 kg mass. The mass begins from rest at a height (h1) of .980 m above the base of a frictionless inclined plane. The mass slides down the plane and comes to rest when it has compressed the spring a distance (x) of 8.00 cm. If the spring has an elastic constant of 1.46 x 10 to the power of 4 N/m, how far above the base of the plane (h2) is the mass when it comes to rest?

Solution

According to the Conservation of energy law the initial potential energy of the mass is equal the sum of the final potential energy of the mass and the potential energy of the spring:

$$mgh_1 = mgh_2 + \frac{kx^2}{2}.$$

The final height of the mass is

$$h_2 = h_1 - \frac{kx^2}{2mg} = 0.980\ \text{m} - \frac{1.46 \cdot 10^4 \frac{\text{N}}{\text{m}} (8.00 \cdot 10^{-2} m)^2}{2 \cdot 5.60\ \text{kg} \cdot 9.81 \frac{m}{s^2}} = 0.130\ m.$$

Answer: $\mathbf{0.130}\ \boldsymbol{m}$.