Answer on Question #75122-Physics-Other

A 1.42kg block at rest on tabletop is attached to a horizontal spring having constant 17.1 N/m. The spring is initially unstreched. A constant of 20.5 N horizontal force is applied to the object causing the spring to stretch. Find the speed of the block after it has moved 0.246 from equilibrium if the surface between the block and tabletop if frictionless. The acceleration of gravity is 9.8 m/s^2. Answer units in m/s

Solution

From the conservation of energy:

$$Fd = \frac{kd^2}{2} + \frac{mv^2}{2}$$

$$v^2 = \frac{2Fd}{m} - \frac{kd^2}{m}$$

$$v = \sqrt{\frac{2Fd}{m} - \frac{kd^2}{m}} = \sqrt{\frac{2(20.5)(0.246)}{1.42} - \frac{17.1(0.246)^2}{1.42}} = 2.52\frac{m}{s}.$$

Answer: $2.52\frac{m}{s}$.