

PROBLEM 9. A 200-g mass vibrates horizontally without friction at the end of a horizontal spring for which $k = 9.0 \text{ N/m}$. The mass is displaced 3.0 cm from equilibrium and released. Find (a) its maximum speed and (b) its speed when it is 3.0 cm from equilibrium. (c) What is its acceleration in each of these cases?

Given:

$$\begin{aligned} k &= 9.0 \text{ N/m} \\ x_0 &= 0.030 \text{ m} \\ x_1 &= 0.030 \text{ m} \\ m &= 0.200 \text{ kg} \end{aligned}$$

Solution:

$$\text{(a)} \quad v = x_0 \sqrt{\frac{k}{m}}$$

$$v = (0.030) \sqrt{\frac{9.0}{0.200}} = \boxed{0.30 \text{ m/s}}$$

$$\text{(b)} \quad v = \sqrt{\frac{9.0}{0.200} [(0.030)^2 - (0.030)^2]}$$

$$v = \boxed{0.24 \text{ m/s}}$$

(c) $x = 0$

$$a = \frac{k}{m} x = (45 \text{ s}^{-2})(0)$$

$$= \boxed{0}$$

$$x = 0.030 \text{ m}$$

$$a = \frac{k}{m} x = (45 \text{ s}^{-2})(0.030)$$

$$a = \boxed{1.1 \text{ m/s}^2}$$

PROBLEM 10.

Given:

$$\begin{aligned} k &= 300 \text{ N/m} \\ m &= 2.0 \text{ kg} \\ g &= 9.8 \text{ m/s}^2 \end{aligned}$$



$$\text{(a)} \quad h = 2 \frac{mg}{k} = 2 \frac{2.0(9.8)}{300} = \underline{0.13}$$

$$h = \frac{0.13}{2} = \boxed{0.065 \text{ m}}$$

(b) The mass's center point is a distance of 0.065 m below the point from which it was released.

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RS Peters



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