9.

James Huang

$2.2 - 0.27 = 1.93$

$$\frac{1}{2}k(\Delta x)^2 + mgh = \frac{1}{2}mV_B^2$$

$$k(\Delta x^2) + 2mgh = mV_B^2$$

$$V_B = \sqrt{\frac{k(0.0011)^2}{m} + 2gh} \longrightarrow \text{falls at } 1.93\,m$$

$$V_R = \sqrt{\frac{k(\Delta x_R)^2}{m} + 2gh} \longrightarrow \text{falls at } 2.2\,m$$

$$\frac{1.93}{2.2} = \frac{V_B t}{V_R t} \qquad 1.93V_R = 2.2V_B$$

$$V_R = \frac{1.93}{2.2}V_B$$

$$\left(\sqrt{\frac{k(\Delta x_R)^2}{m} + 2gh}\right)^2 = \left(0.877\sqrt{\frac{k(0.0011)^2}{m} + 2gh}\right)^2$$

$$\frac{k(\Delta x_R)^2}{m} + 2gh = 0.877\left(\frac{k(0.0011)^2}{m} + 2gh\right)$$

$$\frac{k}{m}(\Delta x_R)^2 + 2gh = \frac{0.877k(0.0011)^2}{m} + 1.754gh$$

$$\Delta x_R = \sqrt{\left[\frac{0.877(0.0011)^2k}{m} + 1.754gh - 2gh\right]\frac{m}{k}}$$