

Answer on Question #49803-Physics-Mechanics-Kinematics-Dynamics

A mass of $m = 2.10 \text{ kg}$ is attached to an oscillating spring, and the period of oscillation is $T = 1.50\text{s}$. Find the spring constant, and if the total energy is $E = 4.55\text{J}$ find the amplitude of the oscillations.

Solution

The period of oscillation is

$$T = 2\pi\sqrt{\frac{m}{k}},$$

where k is the spring constant.

So, the spring constant is

$$k = m\left(\frac{T}{2\pi}\right)^{-2} = 2.10\left(\frac{1.50}{2\pi}\right)^{-2} = 36.8\frac{\text{N}}{\text{m}}.$$

The total energy is

$$E = \frac{kA^2}{2},$$

where A is the amplitude of the oscillations.

Thus,

$$A = \sqrt{\frac{2E}{k}} = \sqrt{\frac{2 \cdot 4.55}{36.8}} = 0.5 \text{ m}.$$