

Answer on Question #54953-Physics-Mechanics-Kinematics-Dynamics

A spring oscillator is designed with a mass of 0.110 kg. It operates while immersed in a damping fluid, selected so that the oscillation amplitude will decrease to 1.00% of its initial value in 9.12 s. Find the required damping constant for the system. Please Answer in kg/s

Solution

The equation for amplitude is

$$A = 0.01A_{max} = A_{max}$$

$$e^{-\frac{b}{2m}T} = 0.01$$

$$\frac{b}{2m} = -\frac{\ln 0.01}{T} = -\frac{\ln 0.01}{9.12 \text{ s}} = 0.505 \text{ s}^{-1}.$$

Damping constant is

$$b = 0.505 \text{ s}^{-1} \cdot 2 \cdot 0.110 \text{ kg} = 0.111 \frac{\text{kg}}{\text{s}}.$$

Answer: 0.111 $\frac{\text{kg}}{\text{s}}$.