A simple harmonic oscillator has an amplitude of 0.17 m and a period of 0.84 s. Determine the frequency, and the angular frequency of the motion. Write expressions for the time dependence of displacement, velocity and acceleration. What are the maximum values of the velocity and acceleration?

Solution

the frequency $f = \frac{1}{T} = \frac{1}{0.84} = 1{,}19$ Hz

the angular frequency of the motion $\omega = 2\pi f = 7{,}48\ s^{-1}$

the time dependence of displacement $s = 0.17 \times \cos 7{,}48\ t$

the time dependence of the velocity $v = \frac{ds}{dt} = -0.17 \times 7{,}48\ \sin 7{,}48\ t = -1{,}27\ \sin 7{,}48\ t$

the time dependence of acceleration $a = \frac{dv}{dt} = -1{,}27 \times 7{,}48 \cos 7{,}48\ t = -9.5 \cos 7{,}48\ t$

the maximum values of the velocity $v_{\max} = 1{,}27 \frac{m}{s}$

the maximum values of the acceleration $a_{max} = 9.5\ \frac{m}{s^2}$