15-Phys-202

WINTER 2003

Prof. R.A. Serota
Quiz 1 Name _____

1. A body oscillates with a simple harmonic motion (SHM)

$$x = x_m \cos(\omega t + \phi)$$

At time $t = 0$ the displacement is half that of the amplitude of the motion. Find the phase constant.

Solution

At $t = 0$

$$x = x_m \cos\phi = \frac{x_m}{2}$$

whereof

$$\cos\phi = \frac{1}{2}$$

and

$$\phi = \frac{\pi}{3}$$

2. The angular frequency of a block-spring system is given by

$$\omega = \sqrt{\frac{k}{m}}$$

Consider two block-spring systems with the same spring stiffness, $k_1 = k_2$, but whose masses are related by $m_1 = 4m_2$. Find the ratio of the periods of simple harmonic motion T_1/T_2.

Solution

$$\frac{T_1}{T_2} = \frac{\omega_2}{\omega_1} = \sqrt{\frac{m_1}{m_2}} = \sqrt{4} = 2$$