Answer on Question #61013-Physics-Mechanics-Relativity

Derive expressions for average energy of a body executing SHM.

Solution

$$U = \frac{1}{2}kx^2 = \frac{1}{2}kA^2\cos^2(\omega t + \phi)$$

$$K = \frac{1}{2}mv^2 = \frac{1}{2}m\omega^2A^2\sin^2(\omega t + \phi) = \frac{1}{2}kA^2\sin^2(\omega t + \phi)$$

Since $k = m\omega^2$.

$$E = K + U = \frac{1}{2}kA^2\cos^2(\omega t + \phi) + \frac{1}{2}kA^2\sin^2(\omega t + \phi) = \frac{1}{2}kA^2$$