

Consider a mass-spring system, where the oscillation is described by $y = A \sin(\omega t)$.

The kinetic energy of the system is

$$K = \frac{1}{2} m \left(\frac{dy}{dt} \right)^2 .$$

The potential energy of the system is

$$U = \frac{1}{2} k y^2 .$$

The maxima are

$$K_{max} = m \frac{(\omega A)^2}{2} , \text{ and}$$

$$U_{max} = k \frac{A^2}{2} .$$

The total energy E of the system during the oscillations is

A) $E = K_{max} = U_{max} = m \frac{(\omega A)^2}{2} .$

B) $E = K_{max} + U_{max} = m (\omega A)^2 .$

C) $E = K_{max} + U_{max} = k A^2 .$

The total energy $E = K + U$, of the mass-spring system is a conserved quantity. E stays the same throughout the oscillations. When the mass passes the point $y = 0$, its potential energy is 0 and its kinetic energy is at its maximum. At the maximum stretch, its potential energy is maximum and its kinetic energy is 0.

Answer **A**.