

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

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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**.