

## QUESTION



A simple pendulum of length  $l$  is released from rest at an angle  $\theta$  to the vertical. The mass of the bob is  $m$ . The lowest point of the swing is labeled "lowest point".

## ANSWER

At the lowest point, the kinetic energy is maximum and the potential energy is minimum.

$$K_{\text{max}} = \frac{1}{2}mv^2 = mgl(1 - \cos\theta)$$

The potential energy at the lowest point is zero. The potential energy at the highest point is  $mgh$ .

The total mechanical energy is conserved. At the lowest point, the total mechanical energy is  $K_{\text{max}}$ .

At the highest point, the total mechanical energy is  $mgh$ .

$$K_{\text{max}} = mgh$$

$$mgl(1 - \cos\theta) = mgh$$

Therefore, the kinetic energy at the lowest point is  $mgh$ .