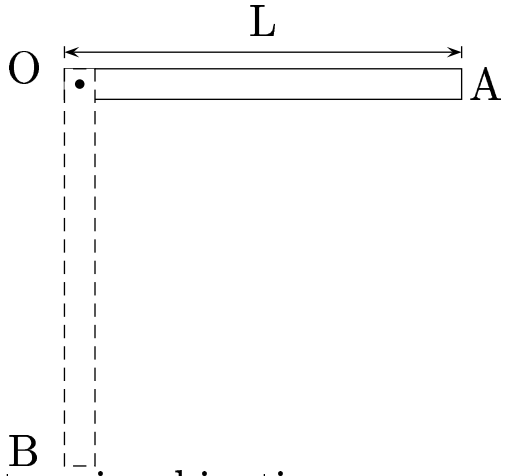

A uniform rod of length L and mass m is free to rotate about O. The rod is released from rest in the horizontal position(state A). Define state B to be when the rod passes the vertical position.

Determine kinetic energy released, from A to B. Denote the angular velocity of the rod at B be ω.

A) $K_B = \dfrac{m\,L^2\,\omega^2}{6}$ and $U_A - U_B = \dfrac{m\,g\,L}{2}$.

B) $K_B = \dfrac{m\,L^2\,\omega^2}{24}$ and $U_A - U_B = \dfrac{m\,g\,L}{2}$.

C) $K_B = \dfrac{m\,L^2\,\omega^2}{6}$ and $U_A - U_B = m\,g\,L$.

D) $K_B = \dfrac{m\,L^2\,\omega^2}{24}$ and $U_A - U_B = m\,g\,L$.

$$U_A - U_B = K_B - K_A = K_B \, .$$

The amount of the potential energy which the rod has released in going from A to B is given by

$$U_A - U_B = \int g \, y \, d \, m = \int g \, y \, \frac{d \, m}{d \, y} \, d \, y = \frac{g \, m}{L} \int y \, d \, y \, .$$

Integrating y from O to L gives

$$U_A - U_B = \frac{m \, g \, L}{2} \, .$$

The kinetic energy of the rod at the state B is

$$K_B = \frac{I \, \omega^2}{2} = \frac{m \, L^2}{3} \, \frac{w^2}{2} = \frac{m \, L^2 \, \omega^2}{6} \, .$$

Answer **A**.

10.08-03˙Rotating˙Rod 2006-10-10