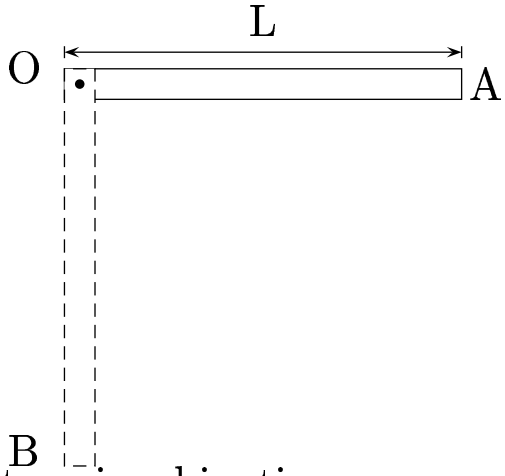

A uniform rod of length L and mass m is free to rotate about O. The rod is released from rest in the horizontal position(state A). Define state B to be when the rod passes the vertical position.

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**.