



A rod has mass m_1 and length L . It is pivoted at the midpoint. The clay has a mass m_2 and velocity v . It hits the top of the rod and sticks to the rod. It causes the rod-clay system to spin about O . Ignore gravity.

The final angular frequency $\omega_f = \frac{L_i}{I_f}$, where L_i is the initial angular momentum and I_f is the final moment of inertia.

- A) $L_i = m_2 v \frac{L}{2}$ and $I_f = \frac{m_1 L^2}{12} + \frac{m_2 L^2}{2}$.
- B) $L_i = m_2 v \frac{L}{2}$ and $I_f = \frac{m_1 L^2}{12} + \frac{m_2 L^2}{4}$.
- C) $L_i = m_2 v L$ and $I_f = \frac{m_1 L^2}{12} + \frac{m_2 L^2}{2}$.
- D) $L_i = m_2 v L$ and $I_f = \frac{m_1 L^2}{12} + \frac{m_2 L^2}{4}$.

By inspection, the initial momentum is

$$m_2 v \frac{L}{2},$$

and the final moment of inertia

$$m_1 \frac{L^2}{12} + m_2 \left(\frac{L}{2} \right)^2.$$

Answer **B**.