



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**.

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