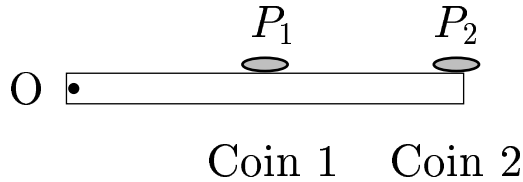


A uniform meter-stick is pivoted at point O. The meter-stick can rotate freely about O. Consider the stick held in the horizontal position. Assume it has a sufficient width.

Coin 1 is placed at  $P_1$ , where  $\overline{OP_1} = \frac{L}{2}$ .

Coin 2 is at  $P_2$  where  $\overline{OP_2} = L$ .

The rod is released from the horizontal position at time  $t = 0$ .



Are the coins expected to stay on the stick immediately after the release of the stick?

- A) Coin 1 will stay-on and coin 2 will stay-on.
- B) Coin 1 will detach and coin 2 will stay-on.
- C) Coin 1 will stay-on and coin 2 will detach.
- D) Coin 1 will detach and coin 2 will detach.

$$\tau = I \alpha = \frac{1}{3} m L^2 \alpha = m \frac{L}{2} g \implies \alpha = \frac{3}{2} \frac{g}{L}$$

The downward acceleration of the stick at  $P_1$  is  $a_1 = \alpha \frac{L}{2} = \frac{3}{4} g$ .

But the coin is being accelerated with a downward acceleration  $g$ . So the coin is being accelerated faster than the stick.

The coin 1 will be temporarily attached itself to the stick.

At  $P_2$ , the downward acceleration of the stick is  $a_2 = \alpha L = \frac{3}{2} g$ .

The point  $P_2$  on the stick is falling faster than coin 2, so coin 2 is expected to detach from the stick right away.

Answer **C**.