Answer on Question #49832- Physics-Mechanics-Kinematics-Dynamics

A weightless rod of length 2l carries two equal masses 'm', one tied at lower end A and the other at the middle of the rod at B. The rod can rotates in vertical plane about a fixed axis passing though C. The rod is released from rest in horizontal position. The speed of mass B at the instant, rod become vertical is

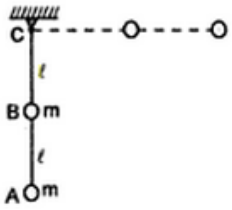
(1) square(3gl/5)

(2) square(4gl/5)

(3) square(6gl/5)

(4) square(7gl/5)

Solution



According to the conservation of energy law:

$$P_i = K_f \to mgl + mg(2l) = \frac{mv_B^2}{2} + \frac{mv_A^2}{2}.$$

The road rotates at some angular speed, when it became vertical:

$$\omega = \frac{v_B}{l} = \frac{v_A}{2l} \to v_A = 2v_B.$$

Thus,

$$3mgl = \frac{mv_B^2}{2} + \frac{m(2v_B)^2}{2} \to v_B = \sqrt{\frac{6gl}{5}}.$$

Answer: (3) $\sqrt{\frac{6gl}{5}}$.