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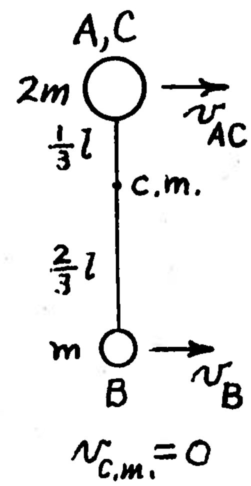
(b) Suppose A and C should just barely collide, i.e., have the same position and equal velocities.



From angular momentum conservation,

$$m\left(\tfrac{2}{3}l\right)v_B - 2m\left(\tfrac{1}{3}l\right)v_{AC} = ml^2\omega_0, \quad v_B - v_{AC} = \tfrac{3}{2}l\omega_0$$

From linear momentum conservation,

$$2m\,v_{AC} + m v_B = 0, \qquad v_B + 2v_{AC} = 0$$

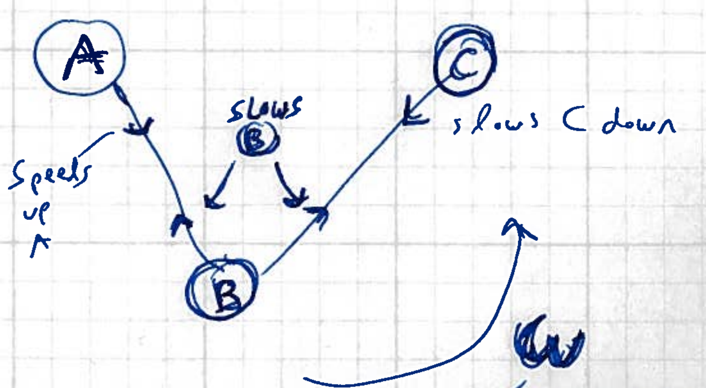
Hence $v_{AC} = -\frac{1}{2}l\omega_0$, $v_B = l\omega_0$

The kinetic energy is

$$T = \tfrac{1}{2}m(l\omega_0)^2 + m\left(-\tfrac{1}{2}l\omega_0\right)^2 = \tfrac{3}{4}ml^2\omega_0^2$$

This is larger than the actual energy $\frac{1}{2}ml^2\omega_0^2$. Hence, A and C cannot collide because there is insufficient energy. A nonzero collision velocity would require even more energy.

AFTER 1st IN-LINE CONFIG,



SLOWS AS B + C SEPARATE, SPEEDS UP AS A + C GET CLOSER

→ SYSTEM OSCILLATES BETWEEN POSITIONS WHILE SPINNING !