

10. Two small balls A and B, each of mass m , are attached rigidly to the ends of a light rod of length d . The structure rotates about the perpendicular bisector of the rod at an angular speed ω . Calculate the angular momentum of the individual balls and of the system about the axis of rotation.

Solution :

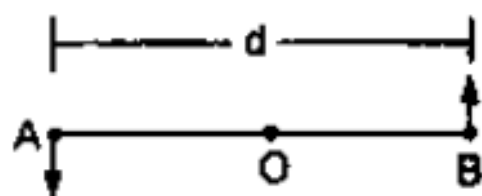


Figure 10-W7

Consider the situation shown in figure (10-W7). The velocity of the ball A with respect to the centre O is $v = \frac{\omega d}{2}$. The angular momentum of the ball with respect

to the axis is $L_1 = mvr = m\left(\frac{\omega d}{2}\right)\left(\frac{d}{2}\right) = \frac{1}{4} m\omega d^2$.

The same is the angular momentum L_2 of the second ball. The angular momentum of the system is equal to sum of these two angular momenta i.e., $L = \frac{1}{2} m\omega d^2$.