



Two masses,  $m_1$  and  $m_2$ , are initially at a radius of  $\frac{R}{2}$ . They are rotating about the axis  $AA'$  with an angular velocity  $\omega_i$ .

Then they are released to a radius of  $R$ .

Determine their new angular velocity,  $\omega_f$ , after release. Assume the process is releasing  $m_1$  and  $m_2$  does not lead to a change in the angular momentum.

- A)  $\omega_f = 4\omega_i$ .
- B)  $\omega_f = 2\omega_i$ .
- C)  $\omega_f = \frac{\omega_i}{2}$ .
- D)  $\omega_f = \frac{\omega_i}{4}$ .

Conservation of angular momentum give,  $I_i \omega_i = I_f \omega_f$ , so  $\omega_f = \frac{I_i}{I_f} \omega_i$ .

But " $I = \sum m r^2$ ".

When  $r$  is doubled,  $I$  is increasing by a factor of 4.

This leads to  $\omega_f = \frac{\omega_i}{4}$ .

Answer **D**.