

Answer on Question #68148 Physics / Other

Two spheres of mass $m_1 = 2.5$ kg and $m_2 = 3.6$ kg are attached to the ends of a light rigid rod of length 1.0 m. What is the moment of inertia of the system about an axis perpendicular to the rod and

(i) passes through the centre of the rod;

(ii) passes through the 2.5 kg sphere.

Solution:

The moment of inertia by definition

$$J = \sum_i m_i r_i^2.$$

So, for the case (i)

$$J = m_1 r_1^2 + m_2 r_2^2 = 2.5 \times \left(\frac{1}{2}\right)^2 + 3.6 \times \left(\frac{1}{2}\right)^2 = 1.525 \text{ kg} \cdot \text{m}^2.$$

For the case (ii)

$$J = m_1 r_1^2 + m_2 r_2^2 = 2.5 \times 0^2 + 3.6 \times 1^2 = 3.6 \text{ kg} \cdot \text{m}^2.$$

Answers:

(i) $1.525 \text{ kg} \cdot \text{m}^2$;

(ii) $3.6 \text{ kg} \cdot \text{m}^2$.