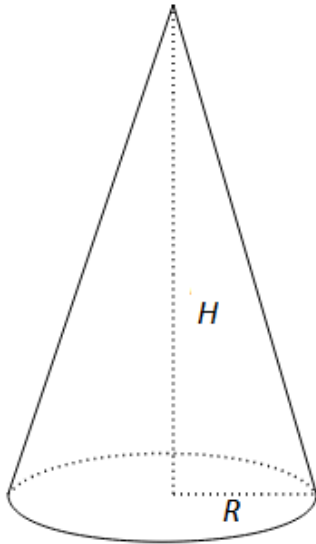


Task:

Calculate the moment of a uniform solid cone about an axis through its centre. The cone has mass m and altitude H , the radius of circular base is R ?

Solution:

Split the cone into disks with thickness dh . Radius of such disk:

$$r = \frac{Rh}{H},$$

R – the radius of circular base,

H – altitude,

h – distance between the top of the cone and the disk.

$$dm = \rho V = \rho \cdot \pi r^2 dh;$$

$$dJ = \frac{1}{2} r^2 dm = \frac{1}{2} \pi \rho r^4 dh = \frac{1}{2} \pi \rho \left(\frac{Rh}{H} \right)^4 dh;$$

$$\begin{aligned} J &= \int_0^H dJ = \frac{1}{2} \pi \rho \left(\frac{R}{H} \right)^4 \int_0^H h^4 dh = \frac{1}{2} \pi \rho \left(\frac{R}{H} \right)^4 \frac{h^5}{5} \Big|_0^H = \\ &= \frac{1}{10} \pi \rho R^4 H = \left(\rho \cdot \frac{1}{3} \pi R^2 H \right) \frac{3}{10} R^2 = \frac{3}{10} m R^2. \end{aligned}$$

Answer:

$$J = \frac{3}{10} m R^2$$