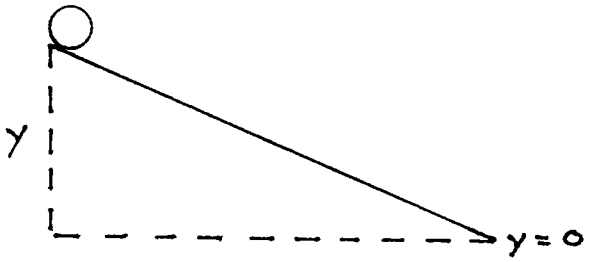
Exercise 9-25



grav. P.E. at top = K.E. at bottom

$\therefore Mgy = \frac{1}{2}Mv^2 + \frac{1}{2}I\omega^2$

Subst. $I = \frac{2}{5}MR^2$ and $\omega = \frac{v}{R}$:

$\therefore Mgy = \frac{1}{2}Mv^2 + \frac{1}{2}\left(\frac{2}{5}MR^2\right)\frac{v^2}{R^2}$

$\therefore gy = \frac{1}{2}v^2 + \frac{1}{5}v^2$

$= \frac{7}{10}v^2$

$\therefore v = \sqrt{\frac{10}{7}gy} = \sqrt{\frac{10}{7}(9.80\,m/s^2)(20.0\,m)} = 16.7\,m/s$