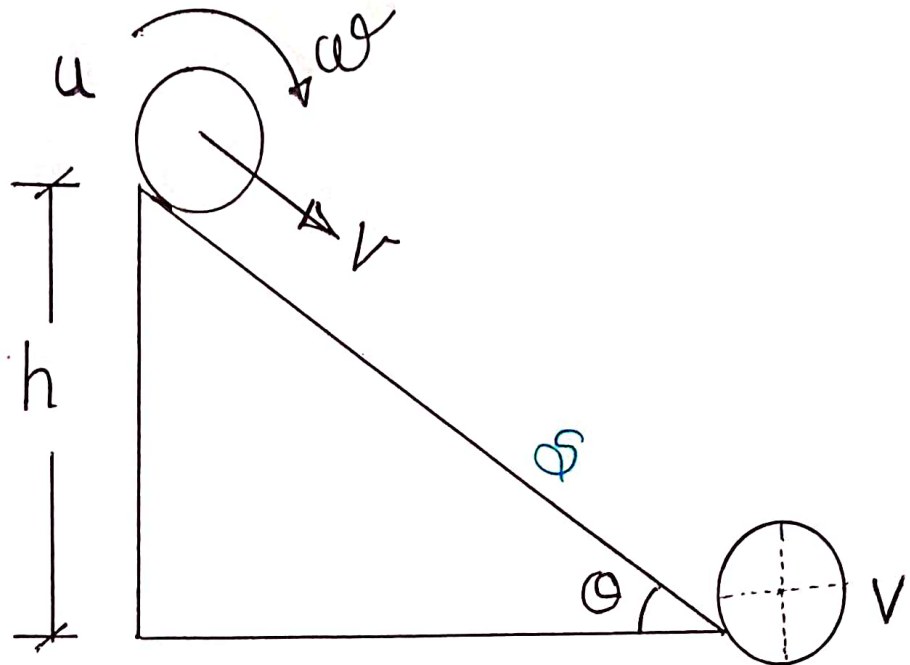


Expression for the linear velocity of rigid body rolling on a inclined plane without slipping.



where,

u = Initial velocity

v = Final velocity at bottom

s = Displacement of the body

h = Height.

Expression for linear velocity

Gravitational P.E. converted into
Kinetic Energy (K.E.)

Gravitational P.E. = (K.E.)_{rolling}

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

$$I = Mk^2$$

$$\omega = \frac{v}{R}$$

$$Mgh = \frac{1}{2} Mv^2 + \frac{1}{2} Mk^2 \times \frac{v^2}{R^2}$$

$$\cancel{M}gh = \frac{1}{2} \cancel{M}v^2 \left[1 + \frac{k^2}{R^2} \right]$$

$$gh = \frac{1}{2} v^2 \left[1 + \frac{k^2}{R^2} \right]$$

$$2gh = v^2 \left[1 + \frac{k^2}{R^2} \right]$$

$$v^2 = \frac{2gh}{\left[1 + \frac{k^2}{R^2} \right]}$$

$$v = \sqrt{\frac{2gh}{\left[1 + \frac{k^2}{R^2} \right]}}$$