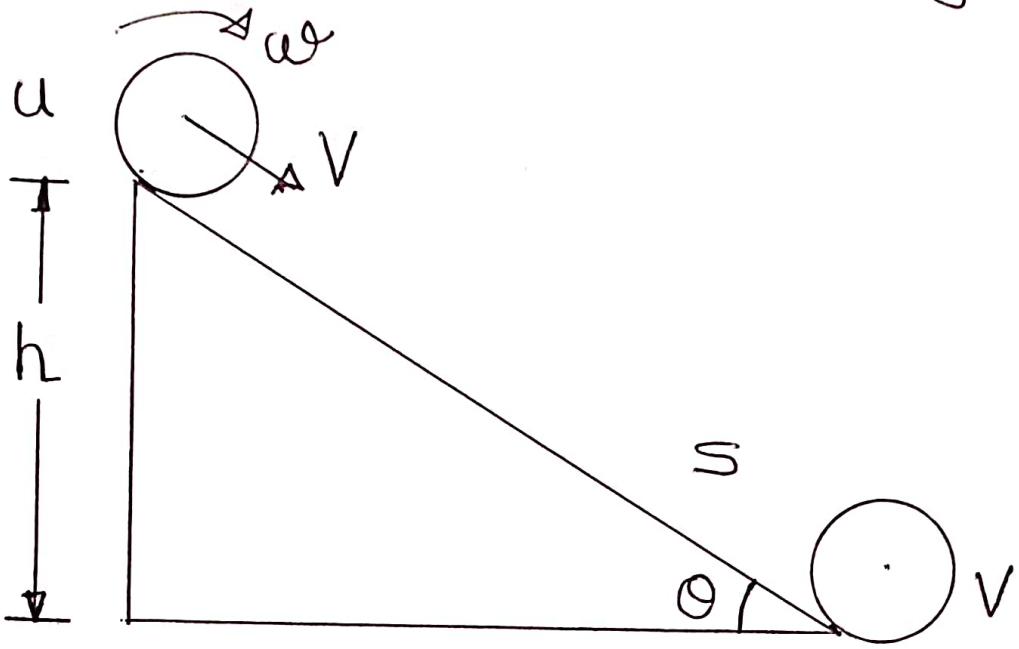
obtain a general expression for the acceleration of rigid body rolling on a inclined plane without slipping.



Where,

u = Initial velocity

V = Final velocity at bottom

S = displacement of the body

h = Height

Let a be the linear acceleration of the body while rolling down the plane

Body starts from rest u = 0

By using kinematical equation,

$$V^2 = u^2 + 2as$$

$$\boxed{u = 0}$$

Putting in above eqn,

$$V^2 = (0)^2 + 2as$$

$$V^2 = 2as$$

$$\boxed{a = \frac{V^2}{2s}} \quad \text{.....(1)}$$

From diagram,

$$\sin\theta = \frac{h}{s}$$

$$\boxed{s = \frac{h}{\sin\theta}}$$

Putting in eqn (1),

$$a = \frac{V^2}{2\left(\frac{h}{\sin\theta}\right)}$$

$$\boxed{a = \frac{V^2 \sin\theta}{2h}}$$

$$V^2 = \frac{2gh}{\left(1 + \frac{K^2}{R^2}\right)}$$

$$a = \frac{\cancel{2}g\cancel{h}\sin\theta}{\left(1 + \frac{K^2}{R^2}\right)\cancel{2}\cancel{h}}$$

$$\boxed{a = \frac{g\sin\theta}{\left(1 + \frac{K^2}{R^2}\right)}}$$