

Motion of Connected Mass.

A point mass is tied to one end of a string which is wound round the solid body [cylinder, pulley, disc]. When the mass is released, it falls vertically downwards and the solid body rotates unwinding the string

m = mass of point-mass, M = mass of a rigid body

R = radius of a rigid body, I = moment of inertia of rotating body

(1) **Downwards acceleration of point mass** $a = \frac{g}{1 + \frac{I}{mR^2}}$

(2) **Tension in string** $T = mg \left[\frac{I}{I + mR^2} \right]$

(3) **Velocity of point mass** $v = \sqrt{\frac{2gh}{1 + \frac{I}{mR^2}}}$

(4) **Angular velocity of rigid body** $\omega = \sqrt{\frac{2mgh}{I + mR^2}}$

