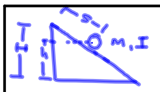

$\omega r = v$

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

$E = E_{Potential} + E_{Kinetic}$

$= mgh + \frac{1}{2}I\omega^2 + \frac{1}{2}mv^2$

$= mgh + \frac{1}{2}I\frac{v^2}{r^2} + \frac{1}{2}mv^2$ $I = \beta mr^2$

$= mgh + \frac{1}{2}\beta mr^2\frac{v^2}{r^2} + \frac{1}{2}mv^2$

$= mgh + \frac{1}{2}m(\beta+1)v^2$

$E_T = mgH$

$mgH = mgh + \frac{m}{2}(1+\beta)v^2$

$mg(H-h) = \frac{m}{2}(1+\beta)v^2$

$\frac{2g(H-h)}{1+\beta} = v^2$

$\sqrt{\frac{2g(H-h)}{1+\beta}} = v$

bigger β
$\Rightarrow$ slower v

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$E_T = mgh + \frac{1}{2}m(1+\beta)v^2$ $a = \frac{\Delta v}{\Delta t}$

$E_T = mg(H - s\sin\theta)$
$+ \frac{1}{2}m(1+\beta)v^2$

$s\sin\theta = H - h$

$h = H - s\sin\theta$

$0 = -mg\dot{s}\sin\theta + \frac{1}{2}m(1+\beta)2v\dot{v}$

$0 = -mgv\sin\theta + m(1+\beta)v\dot{v}$

$0 = -g\sin\theta + (1+\beta)\dot{v}$

$\dot{s} = \frac{\Delta s}{\Delta t}$

$\dot{v} = \frac{\Delta v}{\Delta t} = \ddot{s}$

$\dot{v} = \frac{g\sin\theta}{1+\beta} \leftarrow$

$\beta_{hoop} = 1$

$\beta_{disk} = \frac{1}{2}$

$\beta_{sphere} = 2/5$

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