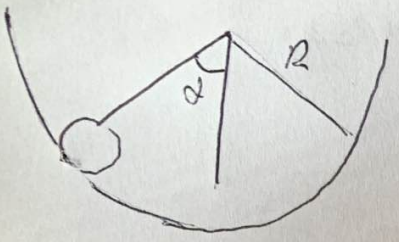
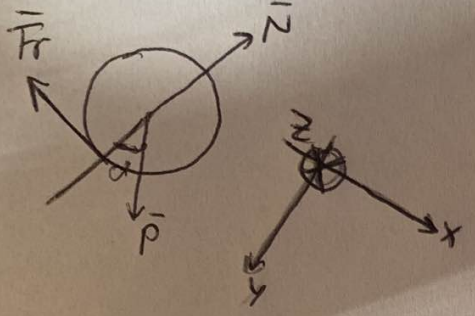
CURSO 10 - Nicole Tarico - 105676




**DATOS** moda sin resbalar

M
$R_{cil} = 18\,cm$
$R_{cano} = 1\,m$
$\alpha = 30°$
$|\bar{g}| = 10\,m/s^2$
$I_{cm\,cil} = \frac{1}{2}MR^2$

DCL




**TRASLACIÓN**

$$\Sigma \bar{F} = \frac{d\bar{p}}{dt} = \frac{d\,m\bar{v}}{dt} = m\frac{d\bar{v}}{dt} = m \cdot \bar{a}$$

**Rotación**

$$\Sigma \bar{M}^{cm} = \frac{d\bar{L}^{cm}}{dt} = \frac{d \cdot \bar{I}_{cm} \cdot \bar{\omega}}{dt} = I_{cm}\frac{d\bar{\omega}}{dt} = I_{cm} \cdot \bar{\gamma}$$

**ecuaciones dinámicas**

$$\Sigma \bar{F} = m \cdot \bar{a}$$

$\hat{x}$) $P\sin\theta - Fr = m \cdot a_{cm}$

$\hat{y}$) $-N + P\cos\theta = 0$

$$\Sigma \vec{M}^{cm} = I_{cm} \cdot \bar{\gamma}$$

$$\vec{M}^{cm}_{P} + \vec{M}^{cm}_{N} + \vec{M}^{cm}_{Fr} = I_{cm} \cdot \bar{\gamma}$$

($\vec{M}^{cm}_{P} = 0$, $\vec{M}^{cm}_{N} = 0$)

$$\vec{M}^{cm}_{Fr} = I_{cm} \cdot \bar{\gamma}$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & R & 0 \\ -Fr & 0 & 0 \end{vmatrix} = I_{cm} \cdot \bar{\gamma}$$

$$\boxed{Fr \cdot R = I_{cm} \cdot \bar{\gamma}}$$

$\hat{z}$) $(P\sin\theta - m a_{cm})R = \frac{1}{2}mR^2 \frac{a_{cm}}{R}$

$mg\sin\theta = \frac{3}{2}m a_{cm}$

$$\boxed{\frac{2g\sin\theta}{3}\hat{i} = \bar{a}_{cm}} \rightarrow \boxed{\bar{\gamma} = \frac{2g\sin\theta}{3R}\hat{z}}$$

Como en la posición final el ángulo es 0, la $a_{cm}$ del caso $\rightarrow$ $\boxed{\bar{a}_{cm} = 0\,m/s^2\,\hat{i}}$

**Condición de rodadura**

$$\bar{v}_{cir} = \bar{v}_{cm} + \bar{\omega} \times \bar{r}_{cm/cir}$$

derivo $\downarrow$

$$\bar{a}_{cir} = \bar{a}_{cm} + \bar{\gamma} \times \bar{r}_{cm/cir} + \bar{\omega} \times [\bar{\omega} \times \bar{r}_{cm/cm}]$$

Uso el tangencial

$$\bar{a}_{cir} = \bar{a}_{cm} + \bar{\gamma} \times \bar{r}_{cm/cir}$$

$$0 = \bar{a}_{cm} + \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \gamma \\ 0 & R & 0 \end{vmatrix}$$

$$\boxed{\bar{a}_{cm} = \gamma \cdot R\hat{i}}$$

b) $\frac{E_{rot}}{E_{trasl}} = \frac{\frac{1}{2} \cdot \frac{1}{2}MR^2 \cdot \omega^2}{\frac{1}{2}M \cdot v_{cm}^2}$

$$\bar{v}_{cir} = \bar{v}_{cm} + \bar{\omega} \times \bar{r}_{cm/cir}$$

$$0 = \bar{v}_{cm} + \bar{\omega} \times \bar{r}_{cm/cir}$$

$$\boxed{\bar{v}_{cm} = \omega \cdot R\hat{i}}$$

$$\frac{E_{rot}}{E_{trasl}} = \frac{\frac{1}{4}MR^2 \frac{v_{cm}^2}{R^2}}{\frac{1}{2}M v_{cm}^2}$$

$$\boxed{\frac{E_{rot}}{E_{trasl}} = \frac{1}{2}}$$