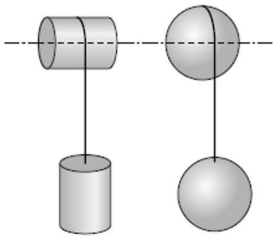
Exercice 14.90

lundi, 25 mai 2020 11:30



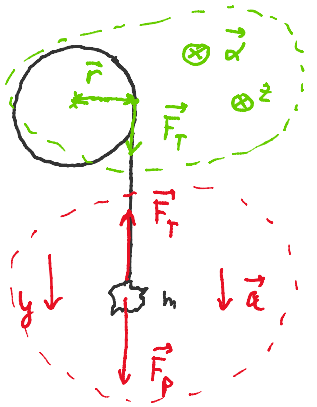
$\Delta = |d_c - d_s|$

$d = \frac{1}{2} a t^2$

$a = ?$

- $\sum \vec{F}_{ext} = m\vec{a}$
- $\sum \vec{M} = I\vec{\alpha}$
- $a = \alpha . r$

$I_c = \frac{1}{2} m_c r_c^2$; $I_s = \frac{2}{5} \cdot m_s r_s^2$ $\rightarrow I = a \cdot m \cdot r^2$



2ème loi rotation : $\sum \vec{M} = \vec{r} \times \vec{F}_T = I\vec{\alpha}$

sur z : $r F_T = I\alpha$ (1)

2ème loi translation : $\sum \vec{F}_{ext} = \vec{F}_p + \vec{F}_T = m\vec{a}$

sur y : $mg - F_T = ma$ (2)

$a = \alpha . r$ (3)

$$\Rightarrow a = \alpha . r = \frac{r F_T}{I} \cdot r = \frac{r^2}{I} \cdot m(g-a) \Rightarrow a\left(1 + \frac{m r^2}{I}\right) = \frac{r^2 m g}{I}$$

(de (1) dans de (2))

$$a = \frac{\frac{r^2 m g}{I}}{1 + \frac{m r^2}{I}} \quad (I = a m r^2) \quad = \frac{g \cdot \frac{m r^2}{a m r^2}}{1 + \frac{m r^2}{a m r^2}} = \frac{\frac{g}{a}}{1 + \frac{1}{a}} = \frac{g}{a} \cdot \frac{1 \cdot a}{a+1} = \frac{g}{a+1}$$

cylindre : $a_c = \frac{g}{1,5}$, $a_c = 1/2$

sphère : $a = 2/5$, $a_s = \frac{g}{1,4}$

$$\Delta = |d_s - d_c| = \left|\frac{1}{2} a_s \cdot 4 - \frac{1}{2} a_c \cdot 4\right| = 2\,|a_s - a_c| = 2g\left|\frac{1}{1,4} - \frac{1}{1,5}\right| \approx 0,93_4$$