Auxiliar 14

$\delta N = n \cdot V$

$F_{col} = 2 \rho A_{\perp} v^2 \cos\phi$

P1 $\vec{P}_x = m_0 v \,\text{sen}\phi \; \hat{\imath}$ $\quad \vec{P}_x' = m_0 v' \,\text{sen}\theta \; \hat{\imath}$

$\vec{P}_y = -m_0 v \cos\phi \; \hat{\jmath}$ $\quad \vec{P}_y' = m_0 v' \cos\theta \; \hat{\jmath}$

$P_x = P_x' \Rightarrow v \,\text{sen}\phi = v' \,\text{sen}\theta \qquad (\;)^2$

$$\boxed{v^2 \text{sen}^2\phi = v'^2 (1 - \cos^2\theta)} \qquad ①$$

cond. enunciado

$$(P_y')^2 = m_0^2 v'^2 \cos^2\theta \overset{6}{=} \lambda (m_0^2 v^2 \cos^2\phi)$$

$$\Rightarrow \boxed{v'^2 \cos^2\theta = \lambda v^2 \cos^2\phi} \qquad ②$$

$$① \Rightarrow \left(\frac{v^2 \text{sen}^2\phi}{1-\cos^2\theta}\right) \cos^2\theta = \lambda v^2 \cos^2\phi$$

$$\Rightarrow \frac{tg^2\phi}{\lambda} = \frac{1}{\cos^2\theta} - 1$$

$$\boxed{tg^2\phi = \lambda\, tg^2\theta} \Rightarrow \boxed{\cos^2\theta = \frac{\lambda}{tg^2\phi + \lambda}}$$

$$①, ② \Rightarrow v^2 \text{sen}^2\phi = v'^2 - v'^2 \cos^2\theta = v'^2 - \lambda v^2 \cos^2\phi$$

$$\Rightarrow \boxed{v'^2 = v^2 (\text{sen}^2\phi + \lambda \cos^2\phi)}$$

$$\delta p = P_y' - P_y = m_0 (v' \cos\theta + v \cos\phi) = m_0 \left(v \sqrt{\text{sen}^2\phi + \lambda\cos^2\phi} \cdot \frac{\sqrt{\lambda}\cos\phi}{\sqrt{\text{sen}^2\phi + \lambda\cos^2\phi}} + v \cos\phi \right)$$

$$\delta p = \boxed{m\, v \cos\phi (\sqrt{\lambda} + 1)} \;/\!/$$

Forma simple

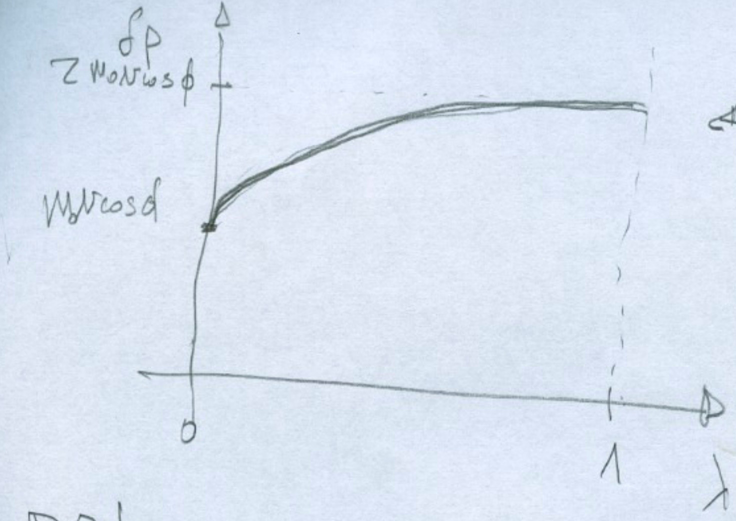
$$(P_y')^2 = (P_y)^2 \lambda$$

$$\boxed{|P_y'| = |P_y| \cdot \sqrt{\lambda}}$$

$$\Rightarrow P_y' - P_y = -P_y \sqrt{\lambda} - P_y$$

$$= |P_y| (\sqrt{\lambda} + 1)$$

$$\boxed{\delta p = m_0 v \cos\phi (\sqrt{\lambda} + 1)} \;/\!/$$



$$\boxed{\delta P = m_0 v \cos\phi \left(\sqrt{\lambda}+1\right)}$$

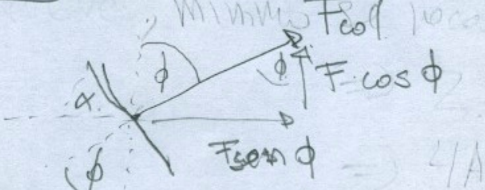
P2

$$v = \omega R = \frac{2\pi R}{T} \quad (1)$$

$$F_{col} = 2A_{\perp}\rho v^2 \cos\phi = 2A\rho v^2 \cos^2\phi \quad (2)$$

$$A = 1\,[m^2] \qquad \rho = 1{,}18\ \frac{kg}{m^3}$$

DCL



$$\alpha + \phi = 90°$$

$$\alpha = 27° \text{ (Enunciado)}$$

$$\Rightarrow (2\vec{F}_{col})$$

$$x)\ F_{col}\cdot \operatorname{sen}\phi - F_{col}\cdot\operatorname{sen}\phi = 0$$

$$y)\ F_{col}\cos\phi + F_{col}\cos\phi - Mg = 0$$

Para que por lo menos suba a v cte.

$$(2) \Rightarrow 2F_{col}\cos\phi = Mg$$

$$4A\rho v^2\cos^3\phi = Mg$$

$$(1) \Rightarrow 4A\rho \frac{4\pi^2R^2}{T^2}\cos^3\phi = Mg \Rightarrow T^2 = \frac{16A\rho\pi^2R^2\cos^3\phi}{Mg}$$

Pero $\cos\phi = \operatorname{sen}\alpha$.

$$\Rightarrow \boxed{T = 4\pi R \operatorname{sen}\alpha \sqrt{\frac{A\rho \operatorname{sen}\alpha}{Mg}}}$$

$$\boxed{T = 0{,}911\ [s]}$$

P3) Consideramos la cantidad de agua que moja entre t y $t+\delta t$ con $\delta t \approx 0$

$$\boxed{Vol_{TOT} = A \cdot v \cdot \delta t} \quad V_0$$ con $A = H \cdot w$ y v: velocidad en el instante

$$N^{\circ} \text{ de gotas} = n \cdot Vol_{tot}$$ con n: nº de gotas por unidad de volumen (densidad de gotas)

$$= n A v \delta t.$$

En términos diferenciales.

$$N^{\circ} \text{ gotas} = n A v(t)\, dt$$

Pero eso para un pequeño intervalo de tiempo.

Considerando que el viaje demora T entonces

$$N = \int_0^T n A v(t)\, dt$$

1.- Si $v(t) = v_0$ constante

$$N = n A v_0 \int_0^T dt = n A v_0 T$$

Pero $T = \frac{L}{v_0} \Rightarrow \boxed{N = nAL}$ no depende ni de T, ni de v_0

2.- Si $a(t) = a_0 \Rightarrow v(t) = \cancel{v_0}^{0} + a t = a t$

$$N = \int_0^T n A a\, t\, dt = n A a \left.\frac{t^2}{2}\right|_0^T = n \frac{A a T^2}{2} = \boxed{nAL} \quad //$$

$$\Rightarrow \boxed{N = nAL} \quad \left(L = \cancel{v_0 T}^{0} + \frac{aT^2}{2} = \frac{aT^2}{2} \right)$$ no depende ni de T ni de a //