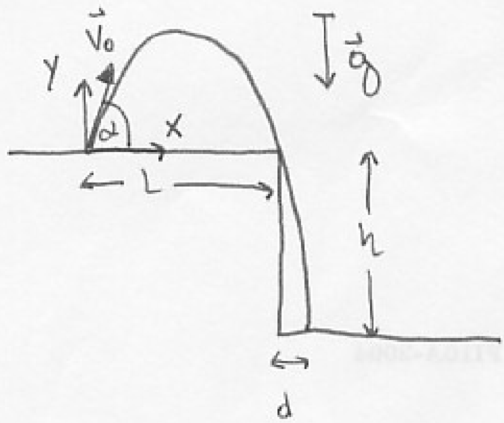
Pauta Ej. 5



$$\vec{a} = \begin{pmatrix} 0 \\ -g \end{pmatrix}$$

$$\Rightarrow x(t) = V_{ox} \cdot t + x_0$$
$$y(t) = -\frac{1}{2} g \cdot t^2 + V_{oy} \cdot t + y_0$$

pero $x_0 = 0$, $y_0 = 0$; $V_{ox} = V_0 \cdot \cos\alpha$, $V_{oy} = V_0 \cdot \operatorname{sen}\alpha$

$$\Rightarrow x(t) = V_0 \cdot \cos\alpha \cdot t$$
$$y(t) = -\frac{1}{2} g t^2 + V_0 \cdot \operatorname{sen}\alpha \cdot t$$

en t^* $\Rightarrow y(t^*) = 0 = -\frac{1}{2} g t^{*2} + V_0 \cdot \operatorname{sen}\alpha \cdot t^*$

$$\Rightarrow \frac{1}{2} g t^{*2} = V_0 \cdot \operatorname{sen}\alpha \cdot t^*$$

$\Rightarrow t^* = 0$ (es correcto) $\vee$ $\frac{1}{2} g t^* = V_0 \cdot \operatorname{sen}\alpha$

$$\Rightarrow \boxed{t^* = \frac{2 V_0 \cdot \operatorname{sen}\alpha}{g}}$$

$$\Rightarrow x(t^*) = L = V_0 \cdot \cos\alpha \cdot t^*$$

$$\Rightarrow L = V_0 \cdot \cos\alpha \cdot \frac{2 V_0 \cdot \operatorname{sen}\alpha}{g}$$

$$\Rightarrow \frac{L \cdot g}{V_0^2} = 2 \cos\alpha \operatorname{sen}\alpha = \operatorname{sen} 2\alpha$$

$$\Rightarrow \boxed{\operatorname{sen} 2\alpha = \frac{Lg}{V_0^2}}$$

Condiciones:

$V_0 \neq 0$ y $-1 \leq \frac{Lg}{V_0^2} \leq 1$ pero $V_0^2 > 0$ $L \cdot g > 0$

$$\Rightarrow 0 \leq \frac{Lg}{V_0^2} \leq 1 \Rightarrow \boxed{V_0 \geq \sqrt{Lg}}$$

Ahora:

$$x(t) = V_0 \cdot \cos\alpha \cdot t$$
$$y(t) = -\frac{1}{2} g t^2 + V_0 \cdot \operatorname{sen}\alpha \cdot t$$

en t'

$$\Rightarrow y(t') = -h = -\frac{1}{2} g t'^2 + V_0 \cdot \operatorname{sen}\alpha \cdot t'$$

$$\Rightarrow \frac{1}{2} g t'^2 - V_0 \cdot \operatorname{sen}\alpha \cdot t' - h = 0 \quad (1)$$

pero

$$x(t') = (L+d) = V_0 \cdot \cos\alpha \cdot t'$$

$$\Rightarrow \boxed{t' = \frac{(L+d)}{V_0 \cdot \cos\alpha}}$$

Reemplazando en (1):

$$\Rightarrow \frac{g(L+d)^2}{2 V_0^2 \cos^2\alpha} - \cancel{V_0} \cdot \operatorname{sen}\alpha \cdot \frac{(L+d)}{\cancel{V_0} \cdot \cos\alpha} - h = 0. \quad / \cdot 2 V_0^2 \cos^2\alpha$$

$$\Rightarrow g(L+d)^2 - V_0^2 2 \frac{\operatorname{sen}\alpha \cos^2\alpha}{\cos\alpha} (L+d) - 2h V_0^2 \cos^2\alpha = 0.$$

$$g(L+d)^2 - V_0^2 \cdot \operatorname{sen}(2\alpha)(L+d) - 2h V_0^2 \cos^2\alpha = 0.$$

$$\Rightarrow (L+d) = \frac{V_0^2 \operatorname{sen}(2\alpha) \pm \sqrt{V_0^4 \operatorname{sen}^2(2\alpha) + 4h V_0^2 \cos^2\alpha \cdot g}}{2g}$$

Se elige raíz "+"

$$\Rightarrow d = \frac{V_0^2 \operatorname{sen}(2\alpha) + \sqrt{V_0^4 \operatorname{sen}^2(2\alpha) + 4h V_0^2 \cos^2\alpha\, g}}{2g} - L$$

$$\text{con } \alpha = \frac{\operatorname{arcsen}\left(\frac{Lg}{V_0^2}\right)}{2}$$