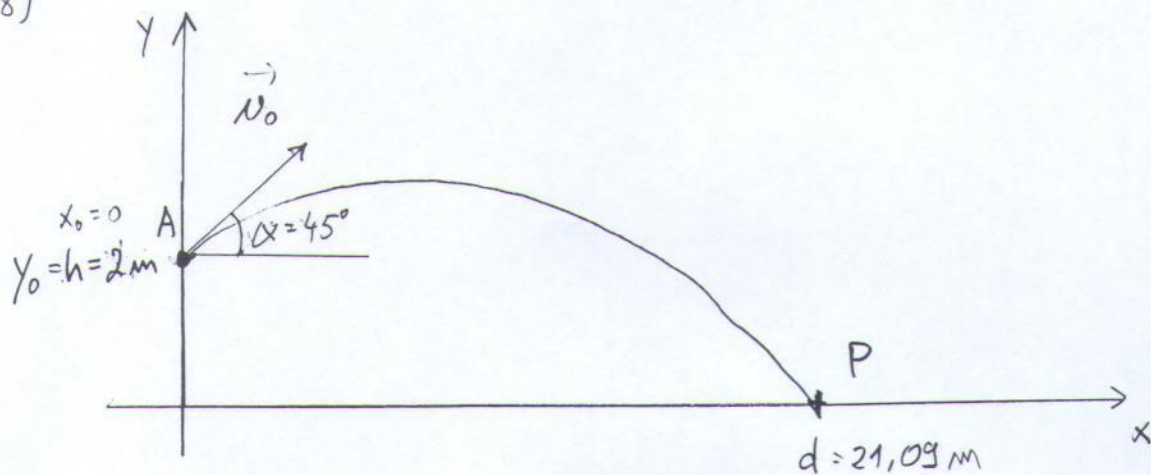


8)



$$\begin{aligned} \textcircled{1} \quad a_y &= -g \\ v_x &= v_0 \cos \alpha & v_y &= v_0 \sin \alpha - g \cdot t \\ x &= v_0 \cos \alpha \cdot t & y &= -\frac{1}{2} g t^2 + v_0 \sin \alpha \cdot t + y_0 \\ y &= -\frac{1}{2} \frac{g}{v_0^2 \cos^2 \alpha} \cdot x^2 + \tan \alpha \cdot x + h \end{aligned}$$

② Impact $P(x=d; y=0)$

$$\begin{aligned} -\frac{1}{2} \frac{g}{v_0^2 \cos^2 \alpha} \cdot d^2 + \tan \alpha \cdot d + h &= 0 \\ \tan \alpha \cdot d + h &= \frac{1}{2} \frac{g}{v_0^2 \cos^2 \alpha} \cdot d^2 \end{aligned}$$

$$v_0^2 = \frac{g \cdot d^2}{2(\tan \alpha \cdot d + h) \cdot \cos^2 \alpha} = 188,78$$

$$v_0 = 13,74 \frac{\text{m}}{\text{s}}$$

③ Durée $t = \frac{d}{v_0 \cos \alpha} = 2,17 \text{ s}$

④ Sommet $v_y = 0 = -gt + v_0 \sin \alpha \Leftrightarrow t = \frac{v_0 \sin \alpha}{g} =$

$$\text{dans } y = -\frac{1}{2} g t^2 + v_0 \sin \alpha \cdot t + h = -\frac{1}{2} \frac{v_0^2 \sin^2 \alpha}{g} + \frac{v_0^2 \sin^2 \alpha}{g} + h$$

$$y_s = \frac{1}{2} \frac{v_0^2 \sin^2 \alpha}{g} + h = 6,816 \text{ m}$$

⑤ Effet d'un angle légèrement plus plat: $\alpha = 43^\circ$

On cherche x tel que

$$-\frac{1}{2} \frac{g}{v_0^2 \cos^2 \alpha} \cdot x^2 + \tan \alpha \cdot x + h = 0$$

$$A = -0,048525 \quad B = 0,9325 \quad C = 2$$

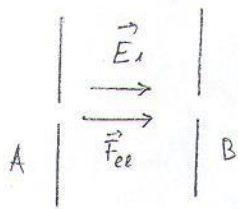
$$\begin{aligned} \Delta &= B^2 - 4AC = 1,2577 \\ x &= \frac{-B \pm \sqrt{\Delta}}{2A} = \begin{cases} -1,947 \text{ m} \\ +21,164 \text{ m} \end{cases} \\ \Rightarrow x_{43^\circ} &> x_{45^\circ} \end{aligned}$$

10)

$$m_{\alpha} = 6,67 \cdot 10^{-27} \text{ kg}$$

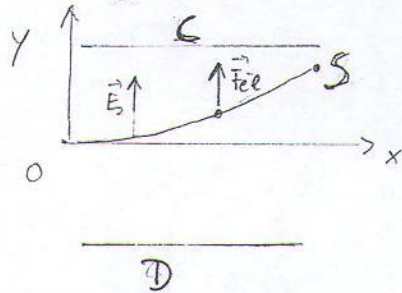
$$q_{\alpha} = 2 \cdot 1,6 \cdot 10^{-19} \text{ C}$$

① B (-) et A (+)



$$U_{AB} > 0$$

③ C (-) et D (+)



D

$$U_{CD} < 0$$

$$v_0 = 5 \cdot 10^5 \frac{\text{m}}{\text{s}}$$

② TEC: $\frac{1}{2} m v^2 = q \cdot U_{acc} \Leftrightarrow U_{acc} = \frac{\frac{1}{2} m v_0^2}{q} = 2605 \text{ V}$

④ $a_y = \frac{q \cdot E}{m}$ avec $E = \frac{U}{d}$

$$v_x = v_0 \quad v_y = a_y \cdot t$$

$$x = v_0 \cdot t \quad y = \frac{1}{2} a_y \cdot t^2$$

Equ. cartésienne

$$y = \frac{1}{2} \frac{a_y}{v_0^2} \cdot x^2$$

⑤ Géométrie: $l = 0,05 \text{ m}$ $d = 0,01 \text{ m}$

$$S(x_s = l; y_s = 0,01 \text{ m})$$

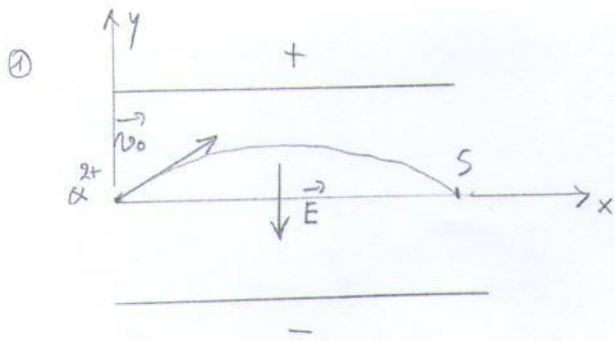
$$\Rightarrow a_y = \frac{2 y_s \cdot v_0^2}{x_s^2} = 2 \cdot 10^{12} \frac{\text{m}}{\text{s}^2}$$

$$\Rightarrow E = \frac{a_y \cdot m}{q} = 41687 \frac{\text{V}}{\text{m}}$$

$$\rightarrow U = E \cdot d = 1667 \text{ V}$$

$$U_{CD} = -1667 \text{ V}$$

11)



$$l = 0,1 \text{ m}$$

$$d = 0,06 \text{ m}$$

$$v_0 = 3 \cdot 10^5 \frac{\text{m}}{\text{s}}$$

$$\alpha = 30^\circ$$

$$\textcircled{2} a_y = -\frac{qE}{m}$$

$$\textcircled{3} v_x = v_0 \cos \alpha \quad v_y = v_0 \sin \alpha + a_y t$$

$$x = (v_0 \cos \alpha) \cdot t \quad y = (v_0 \sin \alpha) t + \frac{1}{2} a_y t^2$$

$$\Rightarrow y = \frac{1}{2} a_y \cdot \frac{x^2}{v_0^2 \cos^2 \alpha} + \tan \alpha \cdot x$$

$$S(x_s = l; y_s = 0)$$

$$0 = \frac{1}{2} a_y \cdot \frac{l^2}{v_0^2 \cos^2 \alpha} + \tan \alpha \cdot l$$

$$\Rightarrow a_y = \frac{-2 \tan \alpha \cdot v_0^2 \cos^2 \alpha}{l} = \frac{-2 \sin \alpha \cos \alpha \cdot v_0^2}{l}$$

$$= -7,794 \cdot 10^{11} \frac{\text{m}}{\text{s}^2}$$

$$\Rightarrow E = \frac{-a_y \cdot m}{q} = 16185 \frac{\text{V}}{\text{m}}$$

$$\Rightarrow U = E \cdot d = 971 \text{ V}$$

$$\textcircled{4} q \cdot U_{\text{acc}} = \frac{1}{2} m v_0^2$$

$$U_{\text{acc}} = \frac{1}{2} \cdot \frac{m v_0^2}{q} = 934 \text{ V}$$