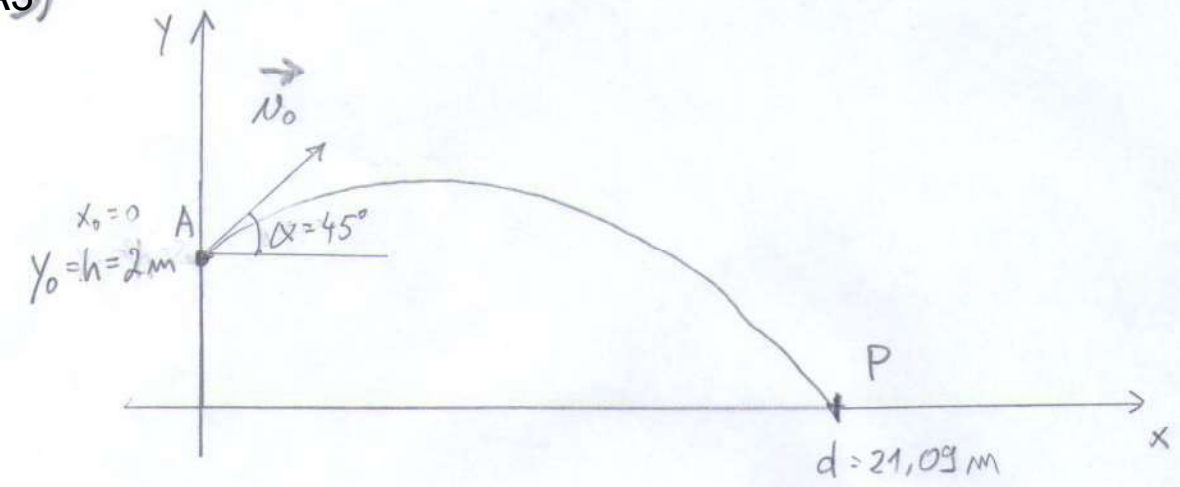
Correction: Enoncé et numérotation: www.physik.dickirch.org

A3)



① $a_y = -g$

$v_x = v_0 \cos\alpha \qquad v_y = v_0 \cdot \sin\alpha - g \cdot t$

$x = v_0 \cos\alpha \, t \qquad y = -\frac{1}{2} g t^2 + v_0 \sin\alpha \cdot t + y_0$

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

② Impact $P(x = d \,;\, y = 0)$

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

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

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

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

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

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

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

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

suppl. comment tirer plus loin

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

On cherche x tel que

$$\underbrace{-\frac{1}{2} \frac{g}{v_0^2 \cdot \cos^2\alpha}}_{A = -0,048525} \cdot x^2 + \underbrace{\tan\alpha}_{B = 0,9325} \cdot x + \underbrace{h}_{C = 2} = 0$$

$\Delta = B^2 - 4AC = 1,2577$

$x = \frac{-B \pm \sqrt{\Delta}}{2A} = \begin{cases} -1,947\,m \\ +21,164\,m \end{cases}$

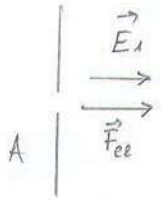
$\Rightarrow x_{P43°} > x_{P45°}$

A5)

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

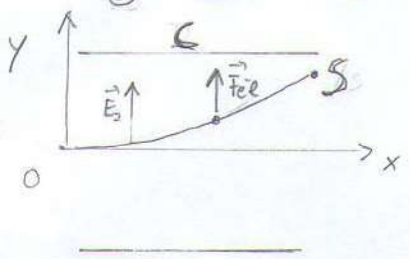
$q_\alpha = 2 \cdot 1{,}6 \cdot 10^{-19}\ C$

① B (−) et A (+)



$U_{AB} > 0$

③ C (−) et D (+)



D

$U_{CD} < 0$

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

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

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

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

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

Equ. cartésienne

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

⑤ Géométrie : $\ell = 0{,}05\ m \qquad d = 0{,}04\ m$

$S\ (x_S = \ell\ ;\ y_S = 0{,}01\ m)$

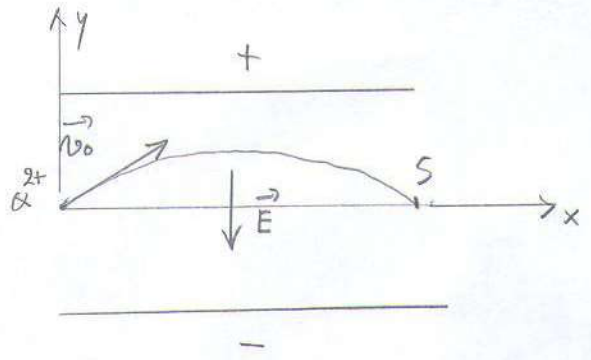
$\Rightarrow a_y = \frac{2 y_S \cdot v_0^2}{x_S^2} = 2 \cdot 10^{12}\ \frac{m}{s^2}$

$\Rightarrow E = \frac{a_y \cdot m}{q} = 41\,687\ \frac{V}{m}$

$\rightarrow U = E \cdot d = 1667\ V$

$U_{CD} = -1667\ V$

A6

① 

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

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

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

$\alpha = 30°$

② $a_y = -\frac{qE}{m}$

③ $v_x = v_0 \cdot \cos\alpha \qquad v_y = v_0 \cdot \sin\alpha + a_y \cdot t$

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

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

$S(x_S = l \,;\, y_S = 0)$

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

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

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

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

$$\Rightarrow U = E \cdot d = 971\,V$$

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

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