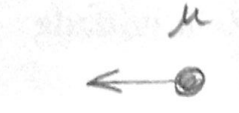
GABARITO

6 - No ref. do e^-:



$$p = \gamma m v$$

$$\gamma = \frac{1}{\sqrt{1-\left(\frac{v}{c}\right)^2}} = \frac{1}{\sqrt{1-\frac{0,87^2 c^2}{c^2}}} = 2,03$$

$$p = 2,03 \cdot 1,90 \times 10^{-28} (-0,87 \times 3 \times 10^3)$$

$$= 1,01 \times 10^{-19} \text{ kg m/s}$$

7 - $\left.\begin{array}{l}\Delta\tau = 2{,}3\ ms \\ \Delta t = 13{,}1\ ms\end{array}\right\} \Delta t = \gamma \Delta\tau \Rightarrow \gamma = \frac{\Delta t}{\Delta\tau} = \frac{13{,}1}{2{,}3} = 5{,}696.$

$$E = \gamma m_x c^2 = K + m_x c^2$$

$$K = (\gamma - 1) m_x c^2$$

$$= (5{,}696 - 1) \times 7 \times 9{,}11 \times 10^{-31} \times (3 \times 10^8)^2$$

$$= 4{,}696 \times 7 \times 9{,}11 \times 9 \times 10^{-31+16}$$

$$= 2694 \times 10^{-15}$$

$$= 2{,}694 \times 10^{-12}\ J = 1{,}7 \times 10^7\ eV = 17 \times 10^6\ eV$$

$$= 17\ MeV$$

PROVA B

$m_x = 1{,}48\ m_e$

⇓

3,6 MeV

8- $2H_2 + O_2 \rightarrow 2H_2O + \text{energia} \equiv K$

⇓

$$2mc^2_{H_2} + m_{O_2} c^2 = 2Mc^2 + K$$

$$2\left[M - (m_{H_2} + m_{O_2})\right] = \frac{K}{c^2}$$

$$\Delta M = \frac{K}{c^2} = 5\ eV/c^2 = 5\ \frac{eV}{c^2}\left(\frac{931{,}49 \times 10^6}{931{,}49 \times 10^6}\right)$$

μ

$$\Delta M = \frac{5}{931{,}49} \times 10^{-6}\ \mu$$

$$= 0{,}00537 \times 10^6\ \mu = 5{,}37\ m\mu$$

14 - Por se tratar de um experimento de interferência em fenda dupla, podemos usar a condição

$$d \operatorname{sen}\theta_m = m\lambda \quad ; m = 0, 1, 2, \ldots$$

de Int. Construtiva.

$$d = 0{,}10\ mm$$

Mas, por se tratar de um feixe de partículas, temos:

$$\lambda = \frac{h}{p} = \frac{h}{m_N v}$$

$$\Rightarrow \quad d \operatorname{sen}\theta = m\lambda = m\frac{h}{m_N v}$$

$$\operatorname{Sen}\theta_n = n\frac{h}{m_N v d}$$

Como $L \ll d \Rightarrow \theta \ll 1 \Rightarrow \operatorname{Sen}\theta_n \approx \operatorname{tan}\theta_n = \frac{Y_n}{L}$

Identificando do gráfico que Y_1 (distância entre dois máx adjacentes) $= 0{,}1\ mm$

$$\operatorname{sen}\theta_1 = \operatorname{tan}\theta_1 = \frac{Y_1}{L} = 1\frac{h}{m_N v d}$$

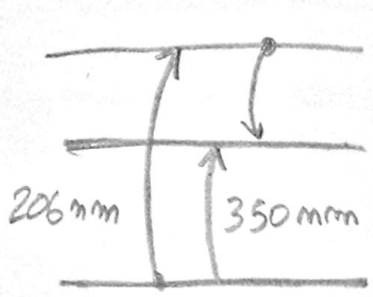
$$L = Y_1 m_N v d / h = \frac{150\times10^{-6}\cdot 1{,}67\times10^{-27}\times 200\times10^{-4}}{6{,}63\times10^{-34}}$$

$$L = 7{,}56\times10^{(3-6-27-4+34)}$$

$$L = 7{,}56\ m$$

Se $v = 135\ m/s \rightarrow L = 5{,}1\ m$

15-



$n=3 \rightarrow 6{,}03\ eV$

$n=2 \rightarrow 3{,}55\ eV$

$n=1 \rightarrow 0\ eV$

$E^{fotón} = hf = \frac{hc}{\lambda}$

$\lambda = 206\ nm \longrightarrow E = 6{,}03\ eV$

$\lambda = 350\ nm \longrightarrow E = 3{,}55\ eV$

$\Delta E_{3\to 2} = 2{,}48 = hc/\lambda$

$\lambda = hc/2{,}48 = 1242/2{,}48 \cong 501\ nm \longrightarrow \lambda$