

AGOSTO 2024

1 a $E_n = \frac{1}{2m} \left(\frac{hn}{2L} \right)^2 = n^2 \frac{(hc)^2}{8mc^2} \cdot \frac{1}{L^2} = n^2 \frac{(12400 \text{ eV}\cdot\text{\AA})^2}{8 \cdot 0,511 \text{ MeV}} \frac{1}{(1\text{\AA})^2}$

$E_n = 37,6 n^2 \text{ eV}$

$E_1 = 37,6 \text{ eV} \quad E_2 = 150,5 \text{ eV} \quad E_3 = 338,5 \text{ eV}$

b No se parecen: $E_n(\text{H}) \propto n^{-2} \quad E_n(\text{pozo}) \propto n^2$

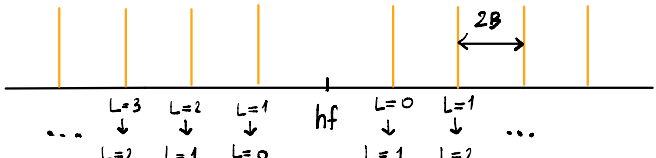
c $\frac{hc}{\lambda} = E_3 - E_2 = 188 \text{ eV} \rightarrow \lambda = \frac{12400 \text{ \AA}}{188} = 66 \text{ \AA}$

d $\int_{x_1}^{x_2} P(x) dx \approx P(x_{\text{medio}}) \Delta x = |\psi_1(0,1\text{\AA})|^2 \cdot 0,02 \text{ \AA}$

$= \frac{2}{1\text{\AA}} \sin^2 \left(\pi \cdot \frac{0,1}{1} \right) \cdot 0,02 \text{ \AA} = 0,0038 \rightarrow 0,38\%$

e $\int_0^{0,25\text{\AA}} \frac{2}{L} \sin^2 \frac{2\pi x}{L} dx = \left[\frac{2x}{2L} - \frac{2L}{2\pi} \cdot \frac{1}{4L} \sin \frac{4\pi x}{L} \right]_0^{0,25L} = 0,25 \rightarrow 25\%$

2 a $hf \pm 2B, hf \pm 4B, hf \pm 6B, hf \pm 8B$

b  c $\mu = \frac{mM}{m+M} \approx 0,98u$

d $f = \frac{\Delta E}{h} \approx \frac{0,3575 \text{ eV}}{4,14 \times 10^{-15} \text{ eVs}} = 8,64 \times 10^{13} \text{ Hz}$ e $k = 4\pi^2 \mu f^2 = 2,99 \times 10^{21} \text{ eV m}^{-2}$

f $B_{\text{calc}} = \frac{\hbar^2}{2m R_{\text{eq}}^2} = 0,00133u \quad B_{\text{graf}} \approx 0,00125u$