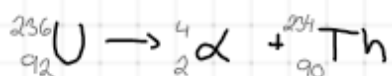


8) Jaká bude energie rozpadu alfa jádra uranu 236? Jakou bude mít energii emitovaná alfa částice a jaká bude její rychlost a de Broglieho vlnová délka? [$Q = 4,579 \text{ MeV}$, $E_K = 4,501 \text{ MeV}$, $v = 0,0491 c$, $\lambda = 6,7 \text{ fm}$]



$$E_\alpha = 3727,4 \text{ MeV}$$

$$E_{236} = 219\,829,5855 \text{ MeV}$$

$$E_{232} = 216\,097,6 \text{ MeV}$$

$$h \cdot \nu = 197,3 \text{ MeV} \cdot \text{fm}$$

Q: $E_{236} = E_\alpha + E_{232} + Q \rightarrow Q = 219\,829,5855 - 3727,4 - 216\,097,6$
 $Q = 4,5855 \text{ MeV}$

E_{α} :

ZZE: $E_{232} + E_{\alpha} = Q$

$$\frac{1}{2} m_{232} \cdot \nu_{232}^2 + \frac{1}{2} m_{\alpha} \cdot \nu_{\alpha}^2 = Q$$

ZZH: $p_{232} = p_{\alpha}$

$$m_{232} \cdot \nu_{232} = m_{\alpha} \cdot \nu_{\alpha} \rightarrow \nu_{232} = \frac{m_{\alpha}}{m_{232}} \cdot \nu_{\alpha}$$

Dosazení ν_{232} do ZZE:

$$\frac{1}{2} m_{232} \left(\frac{m_{\alpha}}{m_{232}} \cdot \nu_{\alpha} \right)^2 + \frac{1}{2} m_{\alpha} \cdot \nu_{\alpha}^2 = Q$$

$$\frac{1}{2} m_{\alpha} \nu_{\alpha}^2 \cdot \left(\frac{m_{\alpha}}{m_{232}} + 1 \right) = Q$$

E_{α}

$$E_{\alpha} = \frac{Q}{\frac{m_{\alpha}}{m_{232}} + 1} = \frac{4,5855}{\frac{3727,4}{216\,097,6} + 1} = 4,5077 \text{ MeV}$$

ν : $E_{\alpha} = \frac{1}{2} m_{\alpha} \cdot \nu_{\alpha}^2 \rightarrow \nu_{\alpha} = \sqrt{\frac{2 \cdot E_{\alpha}}{m_{\alpha}}} = \sqrt{\frac{2 \cdot 4,5077}{3727,4}} = 0,0492 c$

λ : $\lambda = \frac{h}{p} = 2\pi \frac{h \cdot c}{m_{\alpha} \cdot \nu_{\alpha} c} = 2\pi \cdot \frac{197,3}{3727,4 \cdot 0,0492} = 6,76 \text{ fm}$