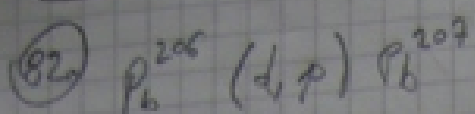
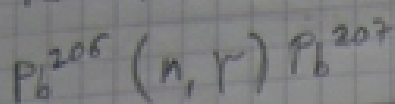


3. CIKLUS



$$Q = 4,5 \text{ MeV}$$



$$B_d = 2,23 \text{ MeV}$$

$$E_\gamma = ?$$

$$Q = (m_{{}^{206}\text{Pb}} + m_d - m_{{}^{207}\text{Pb}} - m_p) c^2$$

$$m_{{}^{206}\text{Pb}} c^2 + m_n c^2 + \cancel{E_{kin}} = m_{{}^{207}\text{Pb}} c^2 + \cancel{E_{p,207}} + E_\gamma$$

generating

$$E_\gamma = m_{{}^{206}\text{Pb}} c^2 - m_{{}^{207}\text{Pb}} c^2 + m_n c^2$$

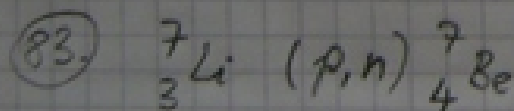
$$m_{{}^{206}\text{Pb}} c^2 - m_{{}^{207}\text{Pb}} c^2 = Q + m_p c^2 - m_n c^2$$

$$B_d = (m_p + m_n) c^2 - m_d c^2 \Rightarrow m_d c^2 = m_p c^2 + m_n c^2 - B_d$$

$$m_{{}^{206}\text{Pb}} c^2 - m_{{}^{207}\text{Pb}} c^2 = Q + m_p c^2 - m_p c^2 - m_n c^2 + B_d$$

$$E_\gamma = Q - m_n c^2 + B_d + m_p c^2$$

$$E_\gamma = Q + B_d = 4,5 + 2,23 = \boxed{6,73 \text{ MeV}}$$



$$Q = -1,647 \text{ MeV}$$

$$E_{proga} = ?$$

$$E_{proga} = (-Q) \frac{m_{{}^7\text{Be}}}{m_{{}^7\text{Be}} - m_p} = 1,647 \cdot \frac{7}{6} = 1,88 \text{ MeV}$$

li izrad:

$$P_f = P_{Be}$$

$$m_{Li} c^2 + m_p c^2 + E_{praga} = m_n c^2 + m_{Be} c^2 + E_{nBe} + E_n$$

$$Q + E_{praga} = E_{Be}$$

$$E_{Be} = \frac{m_{Be} \cdot v_{Be}^2}{2} = \frac{P_{Be}^2}{2m_{Be}} = \frac{P_f^2}{2m_p E_{praga}} \cdot \frac{m_p}{m_{Be}}$$

$$E_{Be} = E_{praga} \cdot \frac{m_p}{m_{Be}}$$

$$(84) \quad {}^{10}_5B(1,2) + {}^7_3Li + 2,3 \text{ MeV} = Q$$

$$Sx = 2 \cdot 10^{-3} \text{ g/cm}^2, \quad S = 1 \text{ cm}^2$$

$$E_n = 20 \text{ MeV} \quad \phi = 10^5 \frac{\text{neutrons}}{\text{cm}^2 \text{ s}} \quad d = 19,8\%$$

$$\delta = 20 \cdot 10^{-24} \text{ cm}^2$$

$$P = ?$$

$$P = \Delta N \cdot E_{\text{elektronica}}$$

$$m_B c^2 + m_n c^2 + E_n = m_f c^2 + m_{Li} c^2 + E_f + E_{Li}$$

$$E_{elek} = E_f + E_{Li} = Q + E_n = 22,3 \text{ MeV}$$

$$\Delta N = \phi \cdot S \cdot \delta \cdot n$$

broj jezgri B^{10} po cm^2 mase

$$n = \frac{\rho x}{M_B} \cdot N_A$$

$$P = \phi \cdot S \cdot \delta \cdot \frac{(\rho x)}{M_B} N_A \cdot 2 (E_f + E_{Li})$$

=)

$$P = 10^5 \cdot 2040^{-24} \cdot 1 \cdot \frac{2 \cdot 10}{10} \cdot 602 \cdot 10^{-23} \cdot 0,198 \cdot (24,5 \cdot 10^{-10})$$

$$P = 1,7 \cdot 10^{-10} \text{ W}$$

$$\int \frac{1}{x} = \ln$$

86.

$$m = 1 \text{ kg} \quad U^{235}$$

$$g = 7000 \frac{\text{kcal}}{\text{g}}$$

$$1 \text{ kcal} = 4,187 \text{ J}$$

Fizijski 1 jezgre oslobodi se 200 MeV-a!

$$E_{235} = N_{235} \cdot 200 \text{ MeV}$$

↓ broj jezgri

$$A = 235$$

$$N = \frac{m}{A} \cdot N_A$$

$$E_{235} = \frac{m}{A} \cdot N_A \cdot 200 \text{ (MeV)} \quad 1,6 \cdot 10^{-13} \text{ J}$$

$$= \frac{1}{235} \cdot 6,022 \cdot 10^{26} \cdot 200 \cdot 1,6 \cdot 10^{-13}$$

$$= 8,2 \cdot 10^{13} \text{ J}$$

$$E_k = m \cdot g = 8,2 \cdot 10^{13} \text{ J}$$

$$m_f = \frac{E_{235}}{g} = \frac{8,2 \cdot 10^{13} \text{ J}}{7000 \cdot 4187 \frac{\text{J}}{\text{g}}} = 0,2738 \cdot 10^7 \text{ kg}$$

DOZIMETRIJA

1. Snop elektrona energije 4 MeV jakosti struje 75 μA prolazi okomito kroz ravnu površinu uzorka nekog tkiva oblika diska promjera 2 cm, a debljine 0,5 cm. Kolika je brzina absorpcije doze D uzorka nekog tkiva?

$$E = 4 \text{ MeV}$$

$$I = 75 \mu\text{A}$$

$$2R = 2 \text{ cm}$$

$$d = 0,5 \text{ cm}$$

$$j = ?$$

$$I = N \cdot e$$

$$R = 0,53 E - 0,16 \rightarrow \text{daseg elektron}$$

$$R = 0,53 \cdot 4 - 0,16 = 2,014 \frac{\text{g}}{\text{cm}^2}$$

$$R_{\text{cm}} = \frac{R \left(\frac{\text{g}}{\text{cm}^2} \right)}{\rho \left(\frac{\text{g}}{\text{cm}^3} \right)} = 2,014 \text{ cm}$$

$$R' = R - d = 2,014 - 0,5 = 1,514 = 0,53 E - 0,16$$

$$0,53 E = 1,514 + 0,16 = 1,674 \text{ cm}$$

$$E = \frac{1,674}{0,53} = 3,1585 \text{ MeV}$$

$$\bar{E}_{\text{aps}} = E - E' = 4 - 3,1585 = 0,8415 \text{ MeV}$$

↓
srednja apsorpcijska energija

$$j = \frac{N \bar{E}_{\text{aps}}}{S \cdot V} = \frac{N \cdot \bar{E}_{\text{aps}}}{S \cdot \left(\frac{\pi R^2}{4} \right) d} = \frac{\frac{I}{e} \cdot \bar{E}_{\text{aps}}}{S \cdot R^2 \pi d}$$

$$j = \frac{75 \cdot 10^{-6} \cdot 0,8415 \cdot 1,6 \cdot 10^{-13}}{1,1 \cdot 10^{-18} \cdot 1000 \cdot (10^{-2})^2 \pi \cdot 5 \cdot 10^{-3}} = 4,48 \cdot 10^4 \frac{\text{Gy}}{\text{s}}$$

② Radnik je primio jednaku dozu za citavo tijelo od 0,3 mGy s time da je dobio dozu od 100 keV neutrona

0,19 mGy od 1,5 MeV elektrona

4,3 mGy od gama zračka

$$D_{100\text{keV}} = 0,3 \text{ mGy}$$

$$Q_1 = 10$$

$$D_{1,5\text{MeV}} = 0,19 \text{ mGy}$$

$$Q_2 = 20$$

$$D_\gamma = 4,3 \text{ mGy}$$

$$Q_3 = 1$$

$$H = ?$$

$$H = Q_1 D_{100} + Q_2 D_{1,5} + Q_3 D_\gamma =$$

$$H = 10 \cdot 0,3 + 20 \cdot 0,19 + 1 \cdot 4,3 = \boxed{11,1 \text{ mSv}}$$