

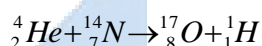
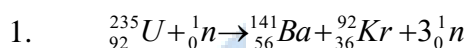
**ΠΑΝΕΛΛΑΔΙΚΕΣ ΕΞΕΤΑΣΕΙΣ 2004**  
**ΕΝΔΕΙΚΤΙΚΕΣ ΑΠΑΝΤΗΣΕΙΣ**

**ΜΑΘΗΜΑ: ΦΥΣΙΚΗ ΓΕΝΙΚΗΣ**

**ΘΕΜΑ 1<sup>ο</sup>**

- 1 γ.  
2 α.  
3 β.  
4 α.  
5 α. Λ β. Σ γ. Σ δ. Λ ε. Λ

**ΘΕΜΑ 2<sup>ο</sup>**



2. γ. 
$$\left. \begin{aligned} E_{3 \rightarrow 1} &= E_{3 \rightarrow 2} + E_{2 \rightarrow 1} \\ E &= h \cdot \frac{c}{\lambda} \end{aligned} \right\} \Rightarrow h \cdot \frac{c}{\lambda_1} = h \cdot \frac{c}{\lambda_3} + h \cdot \frac{c}{\lambda_2} \Rightarrow \frac{1}{\lambda_1} = \frac{1}{\lambda_3} + \frac{1}{\lambda_2} \Rightarrow$$

$$\frac{1}{\lambda_1} = \frac{\lambda_2 + \lambda_3}{\lambda_2 \cdot \lambda_3} \Rightarrow \lambda_1 = \frac{\lambda_2 \cdot \lambda_3}{\lambda_2 + \lambda_3}$$

3. α.  $E_{\text{B,apχ}} = 8 \cdot 200 = 1600 \text{ MeV}$   
 $E_{\text{B,τελ.}} = 2(8,8 \cdot 100) = 2 \cdot 880 = 1760 \text{ MeV}$

$E = E_{\text{B,τελ.}} - E_{\text{B,apχ}} = 1760 - 1600 = 160 \text{ MeV} > 0$

Άρα είναι εξώθερμη

**ΘΕΜΑ 3<sup>ο</sup>**

α. 
$$\left. \begin{aligned} I &= \frac{Q}{t} \\ Q &= N \cdot e \end{aligned} \right\} \Rightarrow I = \frac{N \cdot e}{t} = \frac{10^{17} \cdot 1,6 \cdot 10^{19}}{1} \Rightarrow I = 1,6 \cdot 10^{-2} \text{ A} \Rightarrow I = 0,016 \text{ A}$$

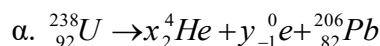
β. 
$$\lambda_{\text{min}} = \frac{h \cdot c}{eV} = \frac{6,4 \cdot 10^{-34} \cdot 3 \cdot 10^8}{1,6 \cdot 10^{-19} \cdot 2 \cdot 10^4} = 6 \cdot 10^{-11} \text{ m}$$

$$\gamma. \quad P_{\delta} = VI = 2 \cdot 10^4 \cdot 1,6 \cdot 10^{-2} = 3,2 \cdot 10^2 = 320W$$

$$a = \frac{P_x}{P_{\delta}} \cdot 100 \Rightarrow P_x = \frac{a \cdot P_{\delta}}{100} = \frac{2 \cdot 330}{100} \Rightarrow P_x = 6,4W$$

#### ΘΕΜΑ 4<sup>ο</sup>

$$\frac{N_0 - N}{N} = \frac{1}{8} \Rightarrow N = 8N_0 - 8N \Rightarrow 9 \cdot N = 8N_0 \Rightarrow N = \frac{8N_0}{9} \quad (A)$$



$$\text{αρχή διατήρησης φορτίου:} \quad 92 = 2x - y + 82 \Rightarrow 2x - y = 10 \quad (1)$$

$$\text{αρχή διατήρησης νουκλεονίων:} \quad 238 = 4x + 206 \Rightarrow 4x = 32 \Rightarrow x = 8$$

$$(1) \Rightarrow 2 \cdot 8 - y = 10 \Rightarrow y = 6$$

Άρα: έχουμε 8 α διασπάσεις και 6 β<sup>-</sup> διασπάσεις

$$\beta. \quad \lambda = \frac{\ln 2}{T_{1/2}} = \frac{0,7 \text{ χρόνια}^{-1}}{4,4 \cdot 10^9} = \frac{7}{45} \cdot 10^{-9} \text{ χρόνια}^{-1} = 0,52 \cdot 10^{-17}$$

γ.

$$N = N_0 \cdot e^{-\lambda t} \Rightarrow \frac{8N_0}{9} = N_0 e^{-\lambda t} \Rightarrow \frac{8}{9} = e^{-\lambda t} \Rightarrow \frac{9}{8} = e^{\lambda t} \Rightarrow \ln \frac{9}{8} = \ln e^{\lambda t} \Rightarrow \ln 9 - \ln 8 = \lambda \cdot t \Rightarrow$$

$$t = \frac{\ln 9 - \ln 8}{\lambda} \Rightarrow t = \frac{2,2 - 2,1}{\frac{7}{45} \cdot 10^{-9}} = \frac{45}{7} \cdot 10^8 \text{ χρόνια}$$