ΑΠΑΝΤΗΣΕΙΣ ΣΤΑ ΘΕΜΑΤΑ ΦΥΣΙΚΗ ΓΕΝΙΚΗΣ ΠΑΙΔΕΙΑΣ
ΗΜΕΡΗΣΙΟΥ ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ
ΠΑΡΑΣΚΕΥΗ 30 ΜΑΪΟΥ 2014

ΘΕΜΑ Α

Α1. δ Α2. γ Α3. β Α4. α

Α5. α) Σ β) Σ γ) Λ δ) Σ ε) Λ

ΘΕΜΑ Β

Β1. $n_\alpha > n_\beta$

$$c = \frac{d}{t} \Leftrightarrow t = d.c = \frac{d}{\frac{c_0}{n}} = \frac{nd}{c_0} \quad \text{οπότε} \quad \begin{cases} t_\alpha = \frac{n_\alpha d}{c_0} \\ t_\beta = \frac{n_\beta d}{c_0} \end{cases} \overset{n_\alpha \gg n_\beta}{\Longleftrightarrow} t_\alpha > t_\beta$$

Β2. $L_n = nt \Leftrightarrow \begin{cases} l_3 = 3t \\ L_1 = 1t \end{cases} \Leftrightarrow L_3 = 3L_1$

$$E_{o\lambda} = -\frac{1}{2} K_c \frac{e^2}{r} = -K \Leftrightarrow K = -E_{o\lambda} \Leftrightarrow K_n = -E_n \Leftrightarrow$$

$$K_n = -\frac{E_1}{n^2} = \begin{cases} K_3 = -\frac{E_1}{9} \\ K_1 = -E_1 \end{cases} \Leftrightarrow \frac{K_3}{K_1} = \frac{1}{9} \quad \kappa\alpha\iota \quad \frac{L_3}{L_1} = 3$$

Β3. $\frac{E_{B_x}}{A} = 7{,}8 \frac{MeV}{\nu ουκλεόνιο} \Longrightarrow \frac{E_{B_\chi}}{200} = 7{,}8 \frac{MeV}{\nu ουκλεόνιο} \Longrightarrow E_{B_x} = 1560\, MeV$

$\frac{E_{B_y}}{A} = 8{,}5 \frac{MeV}{\nu ουκλεόνιο} \Longrightarrow \frac{E_{B_y}}{120} = 8{,}5 \frac{MeV}{\nu ουκλεόνιο} \Longrightarrow E_{B_y} = 1020\, MeV$

$\frac{E_{B_\Omega}}{A} = \alpha \frac{MeV}{\nu ουκλεόνιο} \Longrightarrow \frac{E_{B_\Omega}}{80} = \alpha \frac{MeV}{\nu ουκλεόνιο} \Longrightarrow E_{B_\Omega} = 80 \cdot \alpha\, MeV$

Έτσι λοιπόν ισχύει: $80\alpha + 1020 - 1560 = 164 \Longrightarrow \alpha = 8{,}8 \frac{MeV}{\nu ουκλεόνιο}$

ΘΕΜΑ Γ

Γ1.

$E = 15keV = 15 \cdot 1{,}6 \cdot 10^{-19} \Longrightarrow E = 24 \cdot 10^{-16} J$

$E = h \cdot f = \frac{hc}{\lambda_1} \Longrightarrow \lambda_1 = \frac{hc}{E} \Longrightarrow \lambda_1 = \frac{6{,}6 \cdot 10^{-34} \cdot 3 \cdot 10^8}{24 \cdot 10^{-16}} \Longrightarrow \lambda_1 = 8{,}25 \cdot 10^{-11} m$

Γ2.

$\lambda_{min} = \frac{1}{3} \lambda_1 \Longrightarrow \lambda_{min} = 2{,}75 \cdot 10^{-11} m$

$\lambda_{min} = \frac{hc}{eV} \Longrightarrow V = \frac{hc}{e\lambda_{min}} = \frac{6{,}6 \cdot 10^{-34} \cdot 3 \cdot 10^8}{1{,}6 \cdot 10^{-19} \cdot 2{,}75 \cdot 10^{-11}} = 45.000\, Volt$

Γ3.

$I = \frac{Nq}{t} = \frac{2 \cdot 10^{17} \cdot 1{,}6 \cdot 10^{-19}}{1} = 3{,}2 \cdot 10^{-2} A$

$P = VI = 4{,}5 \cdot 10^4 \cdot 3{,}2 \cdot 10^{-2} = 1440\, Watt$

Γ4.

$$\begin{cases} K = \frac{1}{2}mu^2 \\ K' = \frac{1}{2}m u_1^2 \end{cases} \Rightarrow \begin{cases} eV = \frac{1}{2}mu^2 \\ eV' = \frac{1}{2}m\frac{u^2}{4} \end{cases} \Rightarrow V = 4V'$$

$$P' = V'I = 360\,Watt$$

ΘΕΜΑ Δ

Δ1.

$$E_n = \frac{U_n}{2} = -0{,}85\,eV$$

$$E_n = \frac{E_1}{n^2} \Rightarrow n^2 = 16 \Rightarrow n = 4$$

Δ2.

$$E_{απορ} = E_4 - E_1 = 12{,}75\,eV$$

$$E_{απορ} = \frac{50}{100}K_{αρχ} \Rightarrow K_{αρχ} = 25{,}5\,eV$$

Δ3.

$$L_n = 2L1 \Rightarrow nh = 2h \Rightarrow n = 2$$

$$\frac{f_A}{f_B} = \frac{\frac{E_4 - E_2}{h}}{\frac{E_2 - E_1}{h}} = \frac{\frac{E_1}{16} - \frac{E_1}{4}}{\frac{E_1}{4} - \frac{E_1}{1}} = \frac{1}{4}$$

Δ4.

$$\frac{u_2}{u_4} = \frac{\frac{2\pi r_2}{T_2}}{\frac{2\pi r_4}{T_4}} \Rightarrow \frac{\frac{n_2 h}{m r_2}}{\frac{n_4 h}{m r_4}} = \frac{\frac{2\pi r_2}{T_2}}{\frac{2\pi r_4}{T_4}} \Rightarrow \frac{\frac{n_2 h}{m n_2 r_1^2}}{\frac{n_4 h}{m n_4 r_1^2}} = \frac{\frac{2\pi n_2 r_1^2}{T_2}}{\frac{2\pi n_4 r_1^2}{T_4}} \Rightarrow T_4 = 8T_2$$