Διαγώνισμα Φυσική Κατεύθυνσης Γ Λυκείου 13/11/2011

Ζ1.Α

1β, 2γ, 3γ, 4β

Β5

α.Σ, β.Λ, γ.Σ, δ.Λ, ε.Λ

Ζ2.1

$$\mathrm{A}=\frac{\mathrm{A_O}}{e^{\Lambda t}}$$

$$\left.\begin{array}{l}\mu\varepsilon\tau\acute{\alpha}\ \alpha\pi\acute{o}\ \mathrm{N}=2\ \tau\alpha\lambda\alpha\nu\tau\acute{\omega}\sigma\varepsilon\iota\varsigma, \gamma\iota\alpha\ t=2T, A=\frac{Ao}{2}\Rightarrow e^{2\Lambda t}=2\Rightarrow 2\Lambda\mathrm{T}=\ln 2\\ \mu\varepsilon\tau\acute{\alpha}\ \alpha\pi\acute{o}\ N^{'}\ \tau\alpha\lambda\alpha\nu\tau\acute{\omega}\sigma\varepsilon\iota\varsigma, \gamma\iota\alpha\ t^{'}=N^{'}T, A=\frac{Ao}{16}\Rightarrow e^{N^{'}\Lambda t}=16\Rightarrow N^{'}\Lambda\mathrm{T}=4\ln 2\end{array}\right|\Rightarrow$$

$$\Rightarrow N^{'}=8\ \tau\alpha\lambda\alpha\nu\tau\acute{\omega}\sigma\varepsilon\iota\varsigma\ \alpha\pi o\ \tau\eta\nu\ t=0$$

$$\acute{\alpha}\rho\alpha\ \Delta\mathrm{N}=N^{'}-2=6\ \tau\alpha\lambda\alpha\nu\tau\acute{\omega}\sigma\varepsilon\iota\varsigma\ \mu\varepsilon\tau\acute{\alpha}\ \tau\eta\nu\ t=2\mathrm{T}, \sigma\omega\sigma\tau\acute{o}\ \tau o\ \gamma.$$

2.

$$p_1^{'}=-\frac{1}{3}p_1\Rightarrow u_1^{'}=-\frac{1}{3}u_1$$

ΑΔΟ κ ΑΔΚΕ κ $\upsilon_2=0$

$$u_1^{'}=\frac{m-M}{m+M}u_1\Rightarrow\frac{m-M}{m+M}=-\frac{1}{3}\Rightarrow\frac{m}{M}=\frac{1}{2}\ \acute{\alpha}\rho\alpha\ \alpha\ \sigma\omega\sigma\tau\acute{o}.$$

$$u_2^{'}=\frac{2m}{m+M}u_1=\frac{2m}{3m}u_1=\frac{2}{3}u_1\ \acute{\alpha}\rho\alpha\ \beta\sigma\omega\sigma\tau\acute{o}.$$

3.

$$\left.\begin{array}{l}f_{\mathrm{A}}=\frac{1}{2\pi}\sqrt{\frac{\kappa}{m}}\\ f_{\mathrm{B}}=\frac{1}{2\pi}\sqrt{\frac{\kappa}{4m}}\end{array}\right\}\Rightarrow\frac{f_{\mathrm{A}}}{f_{\mathrm{B}}}=2, \sigma\omega\sigma\tau\acute{o}\ \tau o\ \beta.$$

4.

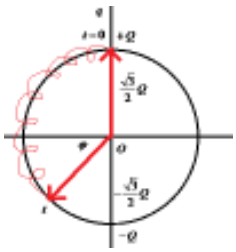
$$\left.\begin{array}{l}U_B=U_E\Rightarrow E-U_E=U_E\Rightarrow 2U_E=E\Rightarrow 2\frac{1}{2}\frac{q^2}{c}=\frac{1}{2}\frac{Q^2}{c}\Rightarrow q=\pm Q\frac{\sqrt{2}}{2}\\ q=Q\sigma\upsilon\nu\omega t\Rightarrow(t=\frac{T}{8})\ q=Q\sigma\upsilon\nu\frac{2\pi}{\mathrm{T}}\frac{\mathrm{T}}{8}\Rightarrow Q\sigma\upsilon\nu\frac{\pi}{4}\Rightarrow q=\pm Q\frac{\sqrt{2}}{2}\end{array}\right\}\ \Sigma\mathrm{XYEI}$$

Ζ3.

$$\left.\begin{array}{l} \gamma\iota\alpha\ t=0\ i=0 \\ q=C_1E=4\cdot10^{-6} \end{array}\right\} t=0\ q=Q$$

$$\text{Άρα}\quad \left.\begin{array}{l} q=Q\sigma\upsilon\nu\omega t \\ i=-I\eta\mu\omega t \\ \omega=\dfrac{1}{\sqrt{LC}}=10^4\,rad/s \\ I=\omega Q=4\cdot10^{-2}\,\text{A} \end{array}\right\} q=4\cdot10^{-6}\sigma\upsilon\nu10^4t\ ,\ i=-4\cdot10^{-2}\eta\mu10^4t\quad SI$$

2.



$$U_E=3U_B\Rightarrow U_E=3(E-U_E)\Rightarrow U_E=\frac{3}{4}E\Rightarrow\frac{1}{2}\frac{q^2}{c}=\frac{3}{4}\frac{1}{2}\frac{Q^2}{c}\Rightarrow q=\pm Q\frac{\sqrt{3}}{2}$$

$$\left.\begin{array}{l} \omega=\dfrac{\Delta\varphi}{\Delta t} \\ \eta\mu\varphi=\dfrac{\sqrt{3}}{2}\Rightarrow\varphi=\dfrac{\pi}{3} \\ \acute{\alpha}\rho\alpha\ \Delta\varphi=\dfrac{\pi}{2}+\dfrac{\pi}{3}=\dfrac{5\pi}{6} \end{array}\right\}\Rightarrow\Delta t=\frac{\Delta\varphi}{\omega}=\frac{5\pi}{6}\cdot10^{-4}\,\text{sec}$$

3.

$$\gamma\iota\alpha\ t=\frac{5\pi}{6}\cdot10^{-4}s,\ q=-\frac{\sqrt{3}}{2}\quad i<0$$

$$V_C=\frac{q}{C}=-\frac{\sqrt{3}}{2}\frac{Q}{C}=-\sqrt{3}\,Volt$$

$$\frac{\Delta Vc}{\Delta t}=\frac{\Delta\left(\frac{q}{c}\right)}{t}=\frac{1}{C}\frac{\Delta q}{\Delta t}=\frac{1}{C}i$$

$$A.\Delta.\text{E.T}\ U_B+U_E=E\Rightarrow\frac{1}{2}Li^2+\frac{1}{2}\frac{q^2}{c}=\frac{1}{2}LI^2\Rightarrow i^2+\frac{3\omega^2Q^2}{4}=I^2\Rightarrow i^2=\frac{I^2}{4}\Rightarrow i=\pm\frac{I}{2},\ i<0$$

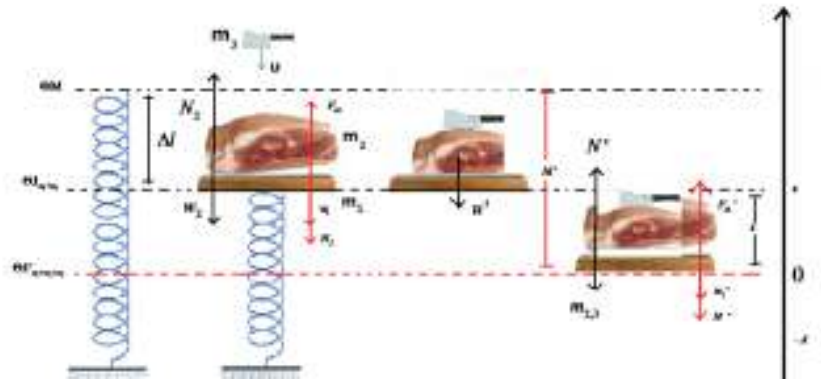
$$\acute{\alpha}\rho\alpha\ i=-\frac{I}{2}=-2\cdot10^{-2}\,\text{A}\ \acute{\alpha}\rho\alpha\ \frac{\Delta Vc}{\Delta t}=-10^4V/s$$

Β.

$$\gamma\iota\alpha\ t=\frac{3\mathrm{T}}{2},\ i=-I\eta\mu\frac{2\pi}{\mathrm{T}}\frac{3\mathrm{T}}{2}\Rightarrow i=0$$

άρα στο κύκλωμα LC_2 *την στιγμή που ανοίγει ο* Δ_1 *κ κλείνει ο* Δ_2.

$$\left.\begin{array}{l} q_2=0\Rightarrow U_E=0 \\ i=0\Rightarrow U_B=0 \end{array}\right| \Rightarrow E=0,\ \delta\varepsilon\nu\ \theta\alpha\ \varepsilon\kappa\tau\varepsilon\lambda\acute{\varepsilon}\sigma\varepsilon\iota\ \eta\lambda.\tau\alpha\lambda\acute{\alpha}\nu\tau\omega\sigma\eta.$$



$$\Theta.\mathrm{I}_{m_1,m_2}:\Sigma F=0\Rightarrow N_2+F_{\varepsilon\lambda}-w_1-w_2-N_2=0\Rightarrow\kappa\cdot\Delta l=(m_1+m_2)g\Rightarrow\Delta l=0,3m$$

$$\Theta.\mathrm{I}_{m_1,m_2,m_3}:\Sigma F=0\Rightarrow N'+F'_{\varepsilon\lambda}-w_1-w_{2,3}-N'=0\Rightarrow\kappa\cdot\Delta l'=(m_1+m_2+m_3)g\Rightarrow\Delta l'=0,4m$$

$$1.A.\Delta.\mathrm{O}:m_3u+0=(m_1+m_2+m_3)u'\Rightarrow u'=\frac{\sqrt{3}}{2}m/s,\ \kappa\acute{\alpha}\tau\omega$$

$$\left.\begin{array}{l} |\Delta\mathrm{K}\%|=\dfrac{\mathrm{K}_{\sigma\upsilon\sigma\tau.\mathrm{APX}}-\mathrm{K}_{\sigma\upsilon\sigma\tau.\mathrm{TE\Lambda}}}{\mathrm{K}_{\sigma\upsilon\sigma\tau.\mathrm{APX}}}\cdot 100 \\ 2.\mathrm{K}_{\sigma\upsilon\sigma\tau.\mathrm{APX}}=\dfrac{1}{2}m_3u^2=60J \\ \mathrm{K}_{\sigma\upsilon\sigma\tau.\mathrm{TE\Lambda}}=\dfrac{1}{2}(m_1+m_2+m_3)\cdot(u')^2=15J \end{array}\right\}|\Delta\mathrm{K}\%|=\frac{45}{60}\cdot 100=75\%$$

3.για t=0 το συσσωμάτωμα στην

$x = \Delta l^{'} - \Delta l = 0,1m$

$\mu\varepsilon\ u = -\frac{\sqrt{3}}{2} m/s$

$\omega = \sqrt{\frac{\kappa}{m_1 + m_2 + m_3}} = 5rad/s$

$\text{Α.Δ.Ε.Τ}_{m_{1,2,3}} : \text{K} + U = E \Rightarrow \frac{1}{2} m_1 u^{'2} + \frac{1}{2} m_{o\lambda} \omega^2 x^2 = \frac{1}{2} m_{o\lambda} \omega^2 A^2 \Rightarrow A^2 = \frac{u^{'2}}{\omega^2} + x^2 \Rightarrow A^2 = \frac{4}{100} \Rightarrow$

$A = 0,2m$

$$\gamma\iota\alpha\ t = 0,\ \begin{matrix} x = +0,1m \\ u < 0 \end{matrix} \Bigg| 0,1 = 0,1\eta\mu\varphi_o \Rightarrow \eta\mu\varphi_o = \frac{1}{2} = \eta\mu\frac{\pi}{6} \Rightarrow \begin{cases} \varphi_o = 2\kappa\pi + \frac{\pi}{6} \Rightarrow (\kappa = 0)\ \varphi_o = \frac{\pi}{6} \\ \varphi_o = 2\kappa\pi + \frac{5\pi}{6} \Rightarrow (\kappa = 0)\ \varphi_o = \frac{5\pi}{6} \end{cases}$$

$$\gamma\iota\alpha\ t = 0 \quad \begin{matrix} u = \omega\text{Α}\sigma\upsilon\nu\frac{\pi}{6} > 0\ \alpha\pi o\rho\rho \\ u = \omega\text{Α}\sigma\upsilon\nu\frac{5\pi}{6} < 0\ \delta\varepsilon\kappa\tau\acute{\eta} \end{matrix} \Bigg| \acute{\alpha}\rho\alpha\ \varphi_o = \frac{5\pi}{6}$$

Άρα $x = 0,2\eta\mu(5t + \frac{5\pi}{6})$

4.

$\gamma.\alpha.\tau_{m_2,m_3} : \Sigma F = -(m_2 + m_3)\omega^2 \cdot x^2 \Rightarrow N - w_{2,3} = -\left(m_2 + m_3\right)\omega^2 \cdot x^2$

$N - 200 = -500x \Rightarrow N = 200 - 500x\ SI$

5.Απώλεια επαφής αν

$N = 0 \Rightarrow 500x = 200 \Rightarrow x = 0,4m\ \ \pi\acute{\alpha}\nu\omega\ \alpha\pi o\ \Theta.\text{Ι}(\sigma\tau o\ \Phi.\text{Μ})$

$\acute{o}\mu\omega\varsigma\ \text{A} = 0,2m < 0,4m\ \acute{\alpha}\rho\alpha\ \ \delta\varepsilon\nu\ \ \chi\acute{\alpha}\nu\varepsilon\tau\alpha\iota\ \ \eta\ \ \varepsilon\pi\alpha\varphi\acute{\eta}$