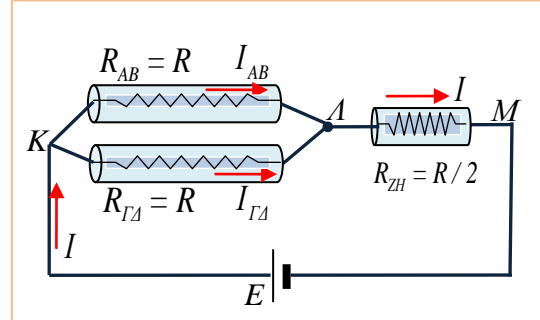


B' τάξη Γενικού Λυκείου: Διαγώνισμα Φυσικής Γενικής Παιδείας- Απαντήσεις

Θέμα Α: 1-δ, 2-δ, 3-β, 4-γ 5(α-Λ, β-Λ, γ-Λ, δ-Σ, ε-Λ)

Θέμα Β:

B.1 Επειδή η αντίσταση δίδεται από τη σχέση $R = \rho \frac{\ell}{S}$ και τα σύρματα είναι όμοια, οι επιμέρους αντιστάσεις είναι ανάλογες του μήκους του σύρματος. $R_{AB} = R_{\Gamma A} = R$ και $R_{ZH} = R/2$.



$$R_{KA} = \frac{R \cdot R}{R + R} = \frac{R}{2} \quad (1) \quad R_{o\lambda} = R_{KA} + R_{AM} \Rightarrow$$

$$R_{o\lambda} = \frac{R}{2} + \frac{R}{2} \Rightarrow \boxed{R_{o\lambda} = R} \quad (2), \quad I = \frac{E}{R_{o\lambda}} \xrightarrow{(2)} \boxed{I = \frac{E}{R}} \quad (3), \quad V_{KA} = IR_{KA} \xrightarrow{(1,3)}$$

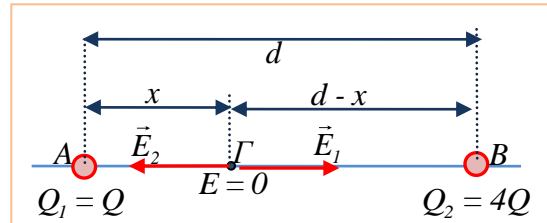
$$V_{KA} = \frac{E R}{R \cdot 2} \Rightarrow \boxed{V_{KA} = \frac{E}{2}} \quad (4). \quad P_{AB} = \frac{V_{AB}^2}{R_{AB}} = \frac{V_{KA}^2}{R} \xrightarrow{(4)} P_{AB} = \frac{E^2}{4R} = P \quad (5)$$

$$P_{o\lambda} = \frac{E^2}{R_{o\lambda}} = \frac{E^2}{R} \quad (6). \quad \text{Από (5) και (6) προκύπτει ότι } \boxed{P_{o\lambda} = 4P}.$$

Άρα σωστή η πρόταση (β).

B.2 $E_1 = E_2 \Rightarrow K \frac{Q}{x^2} = K \frac{4Q}{(d-x)^2}$

$$\Rightarrow \left(\frac{1}{x}\right)^2 = \left(\frac{1}{d-x}\right)^2 \Rightarrow \dots \quad x = \frac{d}{3}$$



$$V_{\Gamma} = K \frac{Q}{x} + K \frac{4Q}{(d-x)} \Rightarrow V_{\Gamma} = K \frac{Q}{d/3} + K \frac{4Q}{2d/3} \Rightarrow \boxed{V_{\Gamma} = 9K \frac{Q}{d}}$$

Άρα σωστή η πρόταση (β).

Θέμα Γ: α) $\Sigma F_y = 0 \Rightarrow F_L = mg \Rightarrow BI\ell = mg \Rightarrow \boxed{I = 2A}$

β) $E = IR_{o\lambda} \Rightarrow E = I(R_1 + R_2 + r) \xrightarrow{s.I} 30 = 2(R_1 + 3 + 2)$

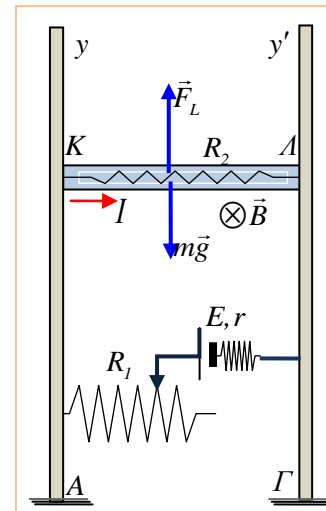
$$\Rightarrow \boxed{R_1 = 10\Omega}$$

γ) $P_{o\lambda} = E \cdot I = 30V \cdot 2A = 60W$, $P_{KA} = I^2 R_2 \Rightarrow P_{KA} = (2A)^2 3\Omega$

$$\Rightarrow P_{KA} = 12W, \quad \pi = \frac{P_{KA}}{P_{o\lambda}} 100\% = \frac{12W}{60W} 100\% \Rightarrow \boxed{\pi = 20\%}$$

δ) $R'_{o\lambda} = R'_1 + R_2 + r = 10\Omega$, $I' = \frac{E}{R'_{o\lambda}} = \frac{30V}{10\Omega} = 3A$

$$F_L = BI'L = 2T \cdot 3A \cdot 0,5m = 3N, \quad \Sigma F_y = Ma \Rightarrow F_L - Mg = Ma \Rightarrow$$



$$a = \frac{F_L - Mg}{M} \Rightarrow \boxed{a = 5 \text{ m/s}^2}$$

Θέμα Δ:

$$\text{A) } R_{o\lambda} = R_1 + R_2 + r = 26\Omega, I = \frac{E}{R_{o\lambda}} = \frac{39\text{V}}{26\Omega} = 1,5\text{A}$$

$$B = 4\pi \cdot 10^{-7} \frac{N}{\ell} I \Rightarrow B = 4\pi \cdot 10^{-7} \text{ N/A}^2 \frac{400}{0,2} 1,5\text{A} \Rightarrow$$

$$\boxed{B = 12\pi \cdot 10^{-4} \text{ T}}$$

$$\text{B) } V_{\pi\lambda} = E - Ir \Rightarrow V_{\pi\lambda} = 39\text{V} - 1,5\text{A} \cdot 2\Omega \Rightarrow V_{\pi\lambda} = 36\text{V}$$

$$P_{\epsilon\zeta} = V_{\pi\lambda} I \Rightarrow P_{\epsilon\zeta} = 36\text{V} \cdot 1,5\text{A} \Rightarrow \boxed{P_{\epsilon\zeta} = 54\text{W}}$$

$$\text{Γ.1) } B'_1 = 12\pi \cdot 10^{-4} \text{ T} - 1,6\pi \cdot 10^{-4} \text{ T} = 10,4\pi \cdot 10^{-4} \text{ T}$$

$$B'_1 = 4\pi \cdot 10^{-7} \frac{N}{\ell} I_1 \Rightarrow 10,4\pi \cdot 10^{-4} = 4\pi \cdot 10^{-7} \frac{400}{0,2} I_1 \Rightarrow$$

$$I_1 = 1,3\text{A},$$

$$V_{A\Gamma} = I_1(R_1 + R_2) = 1,3\text{A}(6 + 18)\Omega \Rightarrow V_{A\Gamma} = 31,2\text{V}$$

$$V_{\pi\lambda} = E - I'r = V_{A\Gamma} = 31,2\text{V} \Rightarrow 39 - I' \cdot 2 = 31,2 \dots \Rightarrow$$

$$\boxed{I' = 3,9\text{A}},$$

$$\text{Γ.2) } I_2 = I' - I_1 = 3,9\text{A} - 1,3\text{A} \Rightarrow \boxed{I_2 = 2,6\text{A}}, R_3 = \frac{V_{A\Gamma}}{I_2} \Rightarrow R_3 = \frac{31,2\text{V}}{2,6\text{A}} \Rightarrow$$

$$\boxed{R_3 = 12\Omega}$$

$$\text{Γ.3) } V_C = I_1 R_2 = 1,3\text{A} \cdot 18\Omega \Rightarrow V_C = 23,4\text{V}, q = CV_C \Rightarrow q = 10\mu\text{F} \cdot 23,4\text{V} \Rightarrow$$

$$\boxed{q = 234\mu\text{C}}$$

