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Física III

Val. 2

1º)

$$E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2} \quad , \quad V(r) = -\int_{\infty}^{R} E\,dr$$

$$V(r) = -\int_{\infty}^{R} \frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{r^2}\cdot dr$$

$$\frac{-q}{4\pi\varepsilon_0}\int_{\infty}^{R}\frac{1}{r^2}\,dr = \frac{-q}{4\pi\varepsilon_0}\left(\frac{-1}{r}\Big|_{\infty}^{R}\right)$$

$$\frac{-q}{4\pi\varepsilon_0}\left(\frac{-1}{R} - \frac{-1}{\infty}\right)$$

$$\frac{-1}{\infty} \to 0$$

$$\frac{q}{4\pi\varepsilon_0}\cdot\frac{1}{R}$$

2º) $(2,1) = x, y$

$-\alpha(x^2 + y)x = V(x,y)$

$E = -\nabla V$

$\nabla V = \left(\frac{\partial V}{\partial x}, \frac{\partial V}{\partial y}\right)$

$\frac{\partial V}{\partial y} = -\alpha x x$

$\frac{\partial V}{\partial x} = -\alpha x^2 - 2xy$

$E_x = 2\alpha xy$, $E_y = \alpha(x^2 + 2y)$

$|E| = \sqrt{(4\alpha)^2 + (6\alpha)^2}$

$|E| = \sqrt{16\alpha^2 + 36\alpha^2}$

$|E| = \sqrt{52\alpha^2} = \alpha\sqrt{52}$

3º) $C = \frac{\varepsilon A}{d}$

$C_1 = \frac{K\varepsilon_0 A}{\frac{d}{3}} = \frac{3K\varepsilon_0 A}{d}$

$C_2 = \frac{\varepsilon_0 A}{\frac{2d}{3}} = \frac{3}{2}\frac{\varepsilon_0 A}{d}$

$\frac{1}{C} = \frac{1}{\frac{3K\varepsilon_0 A}{d}} + \frac{1}{\frac{3\varepsilon_0 A}{2d}}$

$\frac{1}{C} = \frac{d}{3K\varepsilon_0 A} + \frac{2d}{3\varepsilon_0 A}$

$\frac{1}{C} = \frac{d}{3\varepsilon_0 A}\left(\frac{1}{K} + 2\right) = C = \frac{3\varepsilon_0 A}{d} \cdot \frac{1}{\frac{1}{K} + 2}$

$C = \frac{3\varepsilon_0 A}{d\left(\frac{1}{K} + 2\right)}$

4º) $C_{eq_1} = \frac{C_1}{2} = \frac{10\mu F}{2} = 5\mu F$

$C_{eq_2} = C_{eq_1} + C_3 = 5\mu F + 2\mu F = 7\mu F$

$C_t = \frac{C_2 \cdot C_{eq_2}}{C_2 + C_{eq_2}} = \frac{(5\mu F)(7\mu F)}{5\mu F + 7\mu F} = \frac{35\mu F}{12} \simeq 2,92\,\mu F$

$Q = C_T \cdot V$

$10\mu C = (2{,}92\,\mu F) \cdot V$

$V = \frac{10}{2{,}92} \simeq 3{,}42V$

$V_2 = \frac{Q}{C_2} = \frac{10\mu C}{5\mu F} = 2V$