

carga próton: $e = 1.602 \times 10^{-19} \text{ C}$

massa electrão: $m_e = 9.11 \times 10^{-31} \text{ kg}$

$\epsilon_0 = 8,854 \times 10^{-12} \text{ F m}^{-1}$

carga electrão: $-e$

massa próton: $m_p = 1.67 \times 10^{-27} \text{ kg}$

$\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$

$$\mathbf{F}_{12} = K_e \frac{q_1 q_2}{r_{12}^2} \frac{\mathbf{r}_{12}}{r_{12}}; \mathbf{r}_{12} = \mathbf{r}_1 - \mathbf{r}_2$$

$$F_g = \gamma \frac{m_1 m_2}{r_{12}^2}$$

$$\mathbf{E}_{pq} = K_e \frac{q}{r_{pq}^2} \frac{\mathbf{r}_{pq}}{r_{pq}}; \mathbf{r}_{pq} = \mathbf{r}_p - \mathbf{r}_q$$

$$W_{AB} = \int_A^B \mathbf{F} \cdot d\mathbf{l} = \int_A^B (-\mathbf{F}_e) \cdot d\mathbf{l} = -q_0 \int_A^B \mathbf{E} \cdot d\mathbf{l}$$

$$\mathbf{E} = -\nabla\varphi$$

$$\Phi_{\mathbf{E}} = \oint \mathbf{E} \cdot d\mathbf{A} = \frac{q_{\text{dentro}}}{\epsilon_0}$$

$$K_e = \frac{1}{4\pi\epsilon_0} \approx 8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}$$

$$\gamma = 6.67 \times 10^{-11} \frac{\text{Nm}^2}{\text{kg}^2}$$

$$U = K_e \left[\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}} + \dots \right]$$

$$\frac{\Delta U}{q_0} = \varphi_B - \varphi_A = \frac{W_{AB}|_{\text{agente externo}}}{q_0}$$

$$\varphi = K_e \frac{q}{r}$$

$$\lambda = \frac{Q}{L}; \quad \sigma = \frac{Q}{A}; \quad \rho = \frac{Q}{V}$$

$$C = \frac{Q}{V}$$

$$C_{\text{série}}: \frac{1}{C_{\text{eq}}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots$$

$$C = \epsilon_r C_0$$

$$\mathbf{E} = \frac{\mathbf{E}_0}{\epsilon_r}$$

$$\mathbf{P} = \epsilon_0 (\epsilon_r - 1) \mathbf{E}$$

$$C = \frac{\epsilon_0 A}{d} \quad \text{placas paralelas}$$

$$C_{\text{paralelo}}: C_{\text{eq}} = C_1 + C_2 + \dots$$

$$U = \frac{1}{2} QV$$

$$\mathbf{D} = \epsilon \mathbf{E}$$

$$u_E = \frac{\epsilon}{2} E^2$$

$$I = \frac{\Delta Q}{\Delta t} = q n A v$$

$$I = \int_S \mathbf{j} \cdot d\mathbf{S}$$

$$\mathbf{j} = \sigma \mathbf{E}$$

$$\rho = \frac{m}{V}; \quad n = \frac{N}{V}; \quad M_{\text{(massa molar)}} = \frac{m}{n^\circ \text{ mol}}; \quad N_a \text{ (Avogadro)} = \frac{N}{n^\circ \text{ mol}}$$

$$R_{\text{série}}: R = R_1 + R_2$$

$$\text{nós: } \sum_n I_n = 0;$$

$$V = RI$$

$$R = \frac{l}{S\rho}$$

$$\mathbf{j} = q_0 n \langle \mathbf{v} \rangle$$

$$P = VI$$

$$R_{\text{paralelo}}: \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\text{malhas: } \sum_n V_n = 0$$

$$\mathbf{F} = q_0 (\mathbf{E} + \mathbf{v} \times \mathbf{B})$$

$$\mathbf{F}_{d\mathbf{l}} = I d\mathbf{l} \times \mathbf{B}$$

$$d\mathbf{B} = \frac{\mu_0 I}{4\pi} \frac{d\mathbf{l} \times \mathbf{R}}{R^3}$$

$$\oint_{\Gamma} \mathbf{B} \cdot d\mathbf{l} = \mu_0 I = \mu_0 \int_S \mathbf{j} \cdot d\mathbf{S}$$

$$B_{\text{fio}} = \frac{\mu_0 I}{2\pi d}, \quad d \text{ é a menor distância ao fio}$$

$$\Phi_B = \int_S \mathbf{B} \cdot d\mathbf{S} = 0$$