Departamento de Física
Instituto Superior de Engenharia do Porto

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Formulário

$$|\vec{F}| = k\,\frac{q_1\,q_2}{r^2}; \quad \vec{F} = q\,\vec{E}; \quad |\vec{E}| = k\,\frac{q}{r^2}\;; \quad |\vec{E}| = \frac{\Delta V}{d}; \quad |\vec{E}| = \frac{\sigma}{2\varepsilon_0}; \quad (\sigma = \frac{q}{A})$$

$$V = k\frac{q}{r}; \quad E_p = q\,V; \quad W_{A\rightarrow B} = q\,(V_A - V_B); \quad \Delta E_C = -\Delta E_P; \quad E_C = \frac{1}{2}\,m\,v^2; \quad W = \vec{F}\cdot\vec{d}$$

$$i = \frac{dq}{dt}; \quad I = \frac{\Delta Q}{\Delta t}; \quad V = R\,I; \quad R = \rho\frac{l}{A}; \quad \rho - \rho_0 = -\alpha(T - T_0); \quad R_{eq} = \sum_i R_i\,; \quad \frac{1}{R_{eq}} = \sum_i \frac{1}{R_i}$$

$$\mathcal{E} = \frac{E_{transformada}}{Q}; \quad P = \frac{\Delta E}{\Delta t}; \quad P = VI; \quad \sum_i V_i = 0; \quad \sum_i I_i = 0$$

$$V = \frac{Q}{C}; \quad C = \varepsilon\,\frac{A}{d}; \quad \varepsilon_r = \frac{\varepsilon}{\varepsilon_0}; \quad E = \frac{1}{2}Q\,V; \quad C_{eq} = \sum_i C_i\,; \quad 1/C_{eq} = \sum_i 1/C_i$$

$$q(t) = q_{total}\left(1 - \mathrm{e}^{\left(-\frac{t}{\tau}\right)}\right); \quad q(t) = q_{total}\left(e^{-\frac{t}{\tau}}\right); \quad \tau = R_{eq}C; \quad i(t) = I_0 e^{-t/\tau}$$

$$V(t) = V_{máxima}\left(1 - \mathrm{e}^{\left(-\frac{t}{\tau}\right)}\right); \quad V(t) = V_{máxima}\left(e^{-\frac{t}{\tau}}\right);$$

$$\vec{F}_{em} = q\vec{E} + q\vec{v}\times\vec{B} \quad \vec{F}_m = q\,\vec{v}\times\vec{B}, \quad d\vec{F} = I\,d\vec{l}\times\vec{B}; \quad F_c = m\frac{v^2}{R}$$

$$f = \frac{1}{T}; \quad v = \frac{dx}{dt}; \quad \omega = \frac{v}{R}; \quad \omega = 2\pi f; \quad \sum \vec{F}_i = m\vec{a}$$

$$\vec{B} = \frac{\mu_0}{4\pi}\frac{q\,\vec{v}\times\hat{r}}{r^2}; \quad \vec{B} = \frac{\mu_0}{4\pi}\frac{I\,d\vec{l}\times\hat{r}}{r^2}; \quad B = \mu_0\,n\,I\ \text{(solenoide)}; \quad B = \frac{\mu_0}{4\pi}\frac{2I}{R}\ \text{(fio recto e longo)};$$

$$B = \frac{\mu_0}{2}\frac{I}{R}\ (no\ centro\ duma\ espira); \quad \Phi_m = \int \vec{B}\cdot d\vec{A} \quad \Phi_m = N\,B\,A\,cos\theta;$$

$$\varepsilon_{induzida} = -\frac{d\Phi}{dt}\;; \quad \varepsilon_{induzida} = v\,B\,l$$

$$\frac{V_P}{V_S} = \frac{N_P}{N_S}; \quad \frac{i_P}{i_S} = \frac{N_S}{N_P}; \quad P_P = P_S$$

$$\vec{S} = \frac{1}{\mu_0}\vec{E}\times\vec{B}; \quad I = \frac{P}{área} = \frac{Energia}{tempo\times área}; \quad I = |\vec{S}|_{médio} = \frac{1}{2\mu_0}E_m B_m$$

$$E = E_m\,sen(\omega\,t - k\,x); \quad B = B_m\,sen(\omega\,t - k\,x); \quad c = \frac{E_m}{B_m}$$

$$c = \lambda\,f; \quad \omega = 2\pi\,f; \quad k = \frac{2\pi}{\lambda};$$

$I_{transmitido} = I_{incidente} cos^2\theta;$ $n = \frac{c}{v};$ $n_{ar} = 1$

$\theta_{incidente} = \theta_{reflectido}$; $n_1 \sin\theta_{incidente} = n_2 \sin\theta_{refractado}$;

$\theta_{critico} = \sin^{-1}({}^{n_{transmitido}}/_{n_{incidente}})$; $A.N. = \sin\phi = \sqrt{n_{núcleo}^2 - n_{bainha}^2}$

$$\vec{r} = \vec{r}_0 + \vec{v}_0 \cdot t + \frac{1}{2}\vec{a} \cdot t^2$$

$Q = c\,m\,\Delta T;$ $Q = m\,\lambda;$ $\Delta l = l\,\alpha\,\Delta T;$ $\Delta V = V\,\beta\,\Delta T;$ $\lambda_{max}\,T = 2{,}898 \times 10^{-3}$

$q = \frac{\Delta Q}{\Delta t};$ $q = k\,A\,\frac{\Delta T}{\Delta x};$ $q = h\,A\,\Delta T;$ $P = \varepsilon\,\sigma\,A\,T^4;$ $q = \varepsilon\,\sigma\,A\left(T_f^4 - T_{viz}^4\right)$

$q = kA\frac{\partial T}{\partial x}$; $q = \frac{\partial}{\partial x}\left(k\frac{\partial T}{\partial x}\right) + \frac{\partial}{\partial y}\left(k\frac{\partial T}{\partial y}\right) + \frac{\partial}{\partial z}\left(k\frac{\partial T}{\partial z}\right);$ $R = \frac{\Delta x}{k\,A};$ $R = \frac{1}{h\,A}$; $\Delta E_{int} = Q + W$

<u>Constantes Físicas</u>:

$\sigma = 5{,}6697 \times 10^{-8}$ W m^{-2} K^{-4} (Stefan-Boltzmann)

k = 1,381 x 10^{-3} J K^{-1} (Boltzmann)

N_A = 6,022 x 10^{23} mol^{-1} (número de Avogadro)

R = 8,32 J mol^{-1} K^{-1} (constante universal dos gases perfeitos)

$q_{elementar}$ = 1,60217653 × 10^{-19} C

m_e = 9,109 x 10^{-31} kg (massa do electrão)

m_p = 1.673 x 10^{-27} kg (massa do protão)

k = 8,99 x 10^9 N m^2 C^{-2} (constante de Coulomb)

$\varepsilon_0 = 8{,}85 \times 10^{-12}$ C^2 N^{-1} m^{-2} (permissividade eléctrica no vácuo)

μ_0 = 4 π x 10 $^{-7}$ N/A^2 (permeabilidade magnética no vácuo)

c = 3,0 x 10^8 m/s

G = 6,67 x 10^{-11} N m^2 kg^{-2}