

**Équations importantes du tome B**

$$\vec{F}_e = q\vec{E}$$

$$F_e = \frac{k|q_1q_2|}{r^2} \quad E = \frac{k|q|}{r^2}$$

$$\vec{p} = q\vec{d}$$

$$E = \frac{2k|\lambda|}{R}$$

$$\lambda = q/L \quad dq = \lambda dx$$

$$E = \frac{|\sigma|}{2\epsilon_0}$$

$$\sigma = q/A \quad dq = \sigma dA$$

$$\Phi_e = \pm E_{\perp}A \quad \Phi_{e(st)} = \frac{q_i}{\epsilon_0}$$

$$E = \frac{|\sigma_{loc}|}{\epsilon_0}$$

$$U_e = qV$$

$$U_e = \frac{kq_1q_2}{r} \quad V = \frac{kq}{r}$$

$$\Delta V = -\vec{E} \cdot \vec{s} = -Es \cos \theta_{Es}$$

$$\Delta V = \pm E s_{||}$$

$$V_B - V_A = -\int_{x_A}^{x_B} E_x dx$$

$$E_x = -\frac{dV}{dx}$$

$$C = \frac{q}{\Delta V} \quad E = \frac{E_{ext}}{\kappa}$$

$$C_{vide} = \frac{\epsilon_0 A}{d} \quad C = \kappa C_{vide}$$

$$U = \frac{1}{2} \frac{q^2}{C} = \frac{1}{2} C(\Delta V)^2$$

$$= \frac{1}{2} q \Delta V$$

$$u_e = \frac{1}{2} \epsilon_0 E^2$$

$$\mathcal{E} = \left| \frac{\Delta U}{q} \right| \quad \Delta V_{pile\ idéale} = \mathcal{E}$$

$$I = \frac{q}{\Delta t} \quad I = neAv_d$$

$$R = \frac{\Delta V}{I} \quad \Delta V = RI$$

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

$$P = I \Delta V \quad P = RI^2$$

$$P = \frac{(\Delta V)^2}{R}$$

$$\sum I = 0 \quad \sum \Delta V = 0$$

$$R_{\acute{e}q} = \sum R_i \quad R_{\acute{e}q} = \left[ \sum \frac{1}{R_i} \right]^{-1}$$

$$\Delta V = \mathcal{E} \pm r I$$

$$\Delta V_1 = \left( \frac{R_1}{R_1 + R_2} \right) \Delta V$$

$$I_1 = \left( \frac{R_2}{R_1 + R_2} \right) I$$

$$\mathcal{E}_{eff} = \frac{\mathcal{E}_{max}}{\sqrt{2}} \quad I_{eff} = \frac{I_{max}}{\sqrt{2}}$$

$$q_{cc} = C \mathcal{E} \quad \tau = RC$$

$$T_{1/2} = \tau \ln 2$$

$$q = q_{cc}(1 - e^{-t/\tau})$$

$$q = q_{cc} e^{-t/\tau} \quad I = \frac{q_{cc}}{\tau} e^{-t/\tau}$$

$$C_{\acute{e}q} = \left[ \sum \frac{1}{C_i} \right]^{-1} \quad C_{\acute{e}q} = \sum C_i$$

$$\vec{J} = nq\vec{v}_d \quad \vec{E} = \rho \vec{J}$$

$$J = \frac{I}{A}$$

$$\vec{F}_m = q\vec{v} \times \vec{B}$$

$$F_m = |q|vB \sin \theta_{vB}$$

$$\vec{F}_m = I\vec{l} \times \vec{B}$$

$$F_m = I l B \sin \theta_{lB}$$

$$\mu = IA \quad \tau = \mu B \sin \theta_{\mu B}$$

$$dB = \frac{\mu_0}{4\pi} \frac{I dl \sin \theta}{r^2}$$

$$B = \frac{\mu_0}{2\pi} \frac{I}{R}$$

$$B = \frac{\mu_0}{4\pi R} I |\sin \alpha_2 - \sin \alpha_1|$$

$$B = \frac{\mu_0 I}{2R} \quad B = \frac{\mu_0 I}{2R} \sin^3 \alpha$$

$$B = \frac{\mu_0 n I}{2} |\cos \alpha_2 - \cos \alpha_1|$$

$$B = \mu_0 n I$$

$$\Gamma = \pm B_{||} l \quad \Gamma_{pf} = \mu_0 I_s$$

$$\Phi_m = B_{\perp} A \quad \mathcal{E} = \frac{d\Phi_m}{dt}$$

$$\mathcal{E} = vBl$$

$$\Delta V_{2(eff)} = \frac{N_2}{N_1} \Delta V_{1(eff)}$$

$$I_{2(eff)} = \frac{N_1}{N_2} I_{1(eff)}$$

$$\Delta V_L = L \frac{dI}{dt} \quad L = \frac{N\Phi_m}{I}$$

$$L = n^2 \mu_0 A l$$

$$U = \frac{1}{2} LI^2 \quad u_m = \frac{1}{2} \frac{B^2}{\mu_0}$$

$$\tau = \frac{L}{R} \quad I = I_{max}(1 - e^{-t/\tau})$$

$$I = I_{max} e^{-t/\tau}$$

$$\omega = 2\pi f = \frac{2\pi}{T} \quad \omega = \frac{1}{\sqrt{LC}}$$

$$\omega' = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}}$$

$$X = \frac{\Delta V_{max}}{I_{max}} \quad Z = \frac{\Delta V_{max}}{I_{max}}$$

$$X_C = \frac{1}{\omega C} \quad X_L = \omega L$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$\phi = \arctan\left(\frac{X_L - X_C}{R}\right)$$

$$g = 9,8 \text{ m/s}^2$$

$$G = 6,67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$$

$$e = 1,6 \times 10^{-19} \text{ C}$$

$$m_p \approx m_n \approx 1,67 \times 10^{-27} \text{ kg}$$

$$m_e = 9,11 \times 10^{-31} \text{ kg}$$

$$k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$$

$$\epsilon_0 = \frac{1}{4\pi k} = 8,85 \times 10^{-12} \frac{\text{C}^2}{\text{N}\cdot\text{m}^2}$$

$$1 \text{ D} = 3,34 \times 10^{-30} \text{ C}\cdot\text{m}$$

$$1 \text{ eV} = 1,6 \times 10^{-19} \text{ J}$$

$$1 \text{ G} = 10^{-4} \text{ T}$$

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

**Rappels de mécanique (tome A)**

$$v_x = v_{x0} + a_x t$$

$$x = x_0 + v_{x0} t + \frac{1}{2} a_x t^2$$

$$v_x^2 = v_{x0}^2 + 2a_x(x - x_0)$$

$$T = \frac{2\pi r}{v} \quad f = \frac{1}{T} \quad a_c = \frac{v^2}{r}$$

$$\sum \vec{F} = m\vec{a} \quad \vec{F}_g = m\vec{g}$$

$$F_g = \frac{Gm_1m_2}{r^2} \quad g = \frac{Gm}{r^2}$$

$$W = \vec{F} \cdot \vec{s} \quad K = \frac{1}{2} m v^2$$

$$U_g = mgy \quad E = K + U$$

$$E_f = E_i + W_{nc} \quad \Delta E = W_{nc}$$

$$Q = mc\Delta T \quad P = \vec{F} \cdot \vec{v}$$

$$\vec{p} = m\vec{v}$$

$$\tau = \pm r F_{\perp} = \pm r F \sin \phi$$

**Relations mathématiques**

$$\vec{A} \cdot \vec{B} = AB \cos \theta_{AB}$$

$$\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z$$

$$\|\vec{A} \times \vec{B}\| = AB \sin \theta_{AB}$$

$$\frac{d}{dx} \tan(Ax) = A \sec^2(Ax)$$

$$\int \frac{dx}{A^2 + x^2} = \frac{1}{A} \arctan\left(\frac{x}{A}\right) + C$$

$$\int \frac{x dx}{(A^2 + x^2)^{3/2}} = \frac{-1}{\sqrt{A^2 + x^2}} + C$$

$$\int \frac{dx}{(A^2 + x^2)^{3/2}} = \frac{x}{A^2 \sqrt{A^2 + x^2}} + C$$