Nom :

Feuille de formule – Électricité et magnétisme

Constantes :

$g = 9{,}8\ \text{m/s}^2$ $e = 1{,}6\times10^{-19}\,\text{C}$ $k = 9\times10^{9}\,\text{N}\cdot\text{m}^2/\text{C}^2$ $\varepsilon_0 = 8{,}85\times10^{-12}\,\text{C}^2/(\text{N}\cdot\text{m}^2)$ $\mu_0 = 4\pi\times10^{-7}\,\text{kg}\cdot\text{m/C}^2$

$c = 3\times10^{8}\ \text{m/s}$

Électron :	Proton :	Neutron :	Muon :
$m_e = 9{,}11\times10^{-31}\ \text{kg}$	$m_p = 1{,}67\times10^{-27}\ \text{kg}$	$m_n = 1{,}67\times10^{-27}\ \text{kg}$	$m_\mu = 1{,}88\times10^{-28}\ \text{kg}$
$q_e = -e$	$q_p = +e$	$q_n = 0$	$q_\mu = -e$

Formules :

$v_x(t) = \frac{\mathrm{d}\,x(t)}{\mathrm{d}t}$ $x(t) = x_0 + v_{x0}t + \frac{1}{2}a_x t^2$ $a_C = \frac{v^2}{r}$ $\omega_z(t) = \frac{\mathrm{d}\,\theta_z(t)}{\mathrm{d}t}$

$a_x(t) = \frac{\mathrm{d}\,v_x(t)}{\mathrm{d}t}$ $v_x(t) = v_{x0} + a_x t$ $v_x^{\ 2} = v_{x0}^{\ 2} + 2a_x(x - x_0)$ $\alpha_z(t) = \frac{\mathrm{d}\,\omega_z(t)}{\mathrm{d}t}$

$\sum \vec{F} = m\vec{a}$ $\vec{F}_g = m\vec{g}$ $g = G\frac{M}{r^2}$ $F_r = ke$ $f = \mu\ n$

$\vec{F}_e = q\vec{E}$ $\vec{F}_e = k\frac{qQ}{r^2}\hat{r}$ $\vec{E} = k\frac{Q}{r^2}\hat{r}$ $\vec{E} = \int k\frac{\mathrm{d}Q}{r^2}\hat{r}$

$\vec{F}_m = q\,\vec{v}\times\vec{B}$ $\vec{F}_m = I\,\vec{\ell}\times\vec{B}$ $\mathrm{d}\vec{F}_m = I\,\mathrm{d}\vec{\ell}\times\vec{B}$ $\vec{B} = \int \frac{\mu_0}{4\pi}\frac{I\,\mathrm{d}\vec{\ell}\times\hat{r}}{r^2}$

$E = \frac{2k|\lambda|}{R}$ $E = \frac{|\sigma|}{2\varepsilon_0}$ $E = \frac{k|Q|}{D(D+L)}$ $E = \frac{2k|\lambda|}{R}\sin(\alpha)$ $E_\perp = \frac{k|\lambda|}{R}|\sin(\alpha_A) - \sin(\alpha_B)|$ $E_{//} = \frac{k|\lambda|}{R}|\cos(\alpha_A) - \cos(\alpha_B)|$

$B = \frac{\mu_0 I}{2\pi R}$ $B = \frac{\mu_0 I}{4\pi R}|\sin(\alpha_2) - \sin(\alpha_1)|$ $B = N\frac{\mu_0 I}{2R}$ $B = N\frac{\mu_0 I}{2R}\sin^3(\alpha)$ $B = \frac{\mu_0\,n\,I}{2}|\cos(\alpha_2) - \cos(\alpha_1)|$

$E_f = E_i + W_a$ $W = \int \vec{F}\cdot\mathrm{d}\vec{s}$ $W = \vec{F}\cdot\vec{s}$ $E = K + U$ $K = \frac{1}{2}mv^2$

$\vec{p}_f = \vec{p}_i + \vec{J}$ $\vec{J} = \int \vec{F}\,\mathrm{d}t$ $\vec{J} = \vec{F}\,\Delta t$ $\vec{p} = m\vec{v}$ $\vec{F} = \frac{\mathrm{d}\,\vec{p}}{\mathrm{d}t}$

$P = \frac{\mathrm{d}E}{\mathrm{d}t}$ $P = \vec{F}\cdot\vec{v}$ $E = \int P\ \mathrm{d}t$ $U_r = \frac{1}{2}ke^2$ $U_g = mgy$ $U_g = -G\frac{mM}{r}$

$W_c = -\Delta U$ $U_e = qV$ $U_e = k\frac{qQ}{r}$ $U_e = \sum_{i<j} k\frac{q_i q_j}{r_{ij}}$ $U_e = \frac{1}{2}\frac{kq^2}{r}$

$\Delta V = -\int \vec{E}\cdot\mathrm{d}\vec{s}$ $\Delta V = -\vec{E}\cdot\vec{s}$ $E_x = -\frac{\mathrm{d}V}{\mathrm{d}x}$ $V = k\frac{Q}{r}$ $V = V_{ref} - \vec{E}\cdot\vec{s}$ $V = -2k\lambda\ln\left(\frac{r}{[1\text{m}]}\right)$

$C = \frac{q}{\Delta V}$ $U_e = \frac{1}{2}C\Delta V^2$ $C = KC_{\text{vide}}$ $E = \frac{E_{\text{ext}}}{K}$

$C_{\text{vide}} = \frac{\varepsilon_0 A}{d}$ $C_{\text{vide}} = \frac{R}{k}$ $C_{\text{vide}} = \frac{R_A R_B}{k(R_A - R_B)}$ $C_{\text{vide}} = \frac{L}{2k\ln(R_B/R_A)}$

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$\Delta V = \frac{\Delta U_e}{q}$ $\quad I = \frac{\Delta q}{\Delta t}$ $\quad I = n A e v_{\mathrm{d}}$ $\quad \sum_i I_i = 0$ $\quad \sum_i \Delta V_i = 0$ $\quad Q = m C \Delta T$

$\Delta V = R\ I$ $\quad R = \rho \frac{L}{A}$ $\quad R_{\text{éq}} = \sum_i R_i$ $\quad R_{\text{éq}} = \left[\sum_i \frac{1}{R_i}\right]^{-1}$ $\quad q = q_0 e^{-t/RC}$ $\quad T_{1/2} = RC \ln 2$

$P = I \Delta V$ $\quad P = RI^2$ $\quad P = \frac{(\Delta V)^2}{R}$ $\quad \overline{P} = \frac{1}{2}\frac{\varepsilon_0{}^2}{R}$ $\quad \varepsilon_{\text{eff}} = \frac{\varepsilon_0}{\sqrt{2}}$

$\varepsilon_{\text{ind}} = vB\ell \sin\theta$ $\quad \Phi_{\mathrm{m}} = \vec{B}\cdot\vec{A}$ $\quad \Phi_{\mathrm{m}} = \int \vec{B}\cdot \mathrm{d}\vec{A}$ $\quad \varepsilon_{\text{ind}} = \left|\frac{\mathrm{d}\Phi_{\mathrm{m}}}{\mathrm{d}t}\right|$

Mathématique :

$\vec{A} = (A_x, A_y, A_z) = A_x\vec{i} + A_y\vec{j} + A_z\vec{k}$

$A = |\vec{A}| = \sqrt{A_x^2 + A_y^2 + A_z^2}$

$\vec{A}\cdot\vec{B} = |\vec{A}||\vec{B}|\cos(\theta) = A_x B_x + A_y B_y + A_z B_z$

$\vec{A}\times\vec{B} = |\vec{A}||\vec{B}|\sin(\theta)\hat{n} = (A_y B_z - A_z B_y)\vec{i} - (A_x B_z - A_z B_x)\vec{j} + (A_x B_y - A_y B_x)\vec{k}$

$ax^2 + bx + c = 0 \quad \Rightarrow \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$C = 2\pi r, \quad A = \pi r^2, \quad A = 4\pi r^2, \quad V = 4\pi r^3/3$

$\sin^2(\theta) + \cos^2(\theta) = 1$ $\quad 2\cos\theta\sin\theta = \sin(2\theta)$

$\ln(A) + \ln(B) = \ln(AB)$ $\quad \ln(A) - \ln(B) = \ln\left(\frac{A}{B}\right)$

Table de dérivée et d'intégrale :

$\frac{\mathrm{d}x^n}{\mathrm{d}x} = nx^{n-1}$ $\quad \frac{\mathrm{d}e^{Ax}}{\mathrm{d}x} = Ae^{Ax}$ $\quad \frac{\mathrm{d}\ln x}{\mathrm{d}x} = \frac{1}{x}$ $\quad \frac{\mathrm{d}\cos x}{\mathrm{d}x} = -\sin x$ $\quad \frac{\mathrm{d}\sin x}{\mathrm{d}x} = \cos x$ $\quad \frac{\mathrm{d}\tan x}{\mathrm{d}x} = \sec^2 x$

$\int x^n \mathrm{d}x = \frac{x^{n+1}}{n+1} + C$ $\quad \int \frac{1}{x}\mathrm{d}x = \ln|x| + C$ $\quad \int e^{Ax}\mathrm{d}x = \frac{e^{Ax}}{A} + C$

$\int \cos(x)\mathrm{d}x = \sin(x) + C$ $\quad \int \sin(x)\mathrm{d}x = -\cos(x) + C$ $\quad \int \tan(x)\mathrm{d}x = \ln|\sec(x)| + C$

$\int \frac{1}{A^2 + x^2}\mathrm{d}x = \frac{1}{A}\arctan\left(\frac{x}{A}\right) + C$ $\quad \int \frac{x}{(A^2 + x^2)^{3/2}}\mathrm{d}x = \frac{-1}{\sqrt{A^2 + x^2}} + C$ $\quad \int \frac{1}{(A^2 + x^2)^{3/2}}\mathrm{d}x = \frac{x}{A^2\sqrt{A^2 + x^2}} + C$

Dérivée en chaîne :

$\frac{\mathrm{d}}{\mathrm{d}x} f(y(x)) = \frac{\mathrm{d}f}{\mathrm{d}y}\frac{\mathrm{d}y}{\mathrm{d}x}$

Dérivée d'un produit :

$\frac{\mathrm{d}}{\mathrm{d}x} f(x)\cdot g(x) = \frac{\mathrm{d}f(x)}{\mathrm{d}x} g(x) + f(x)\frac{\mathrm{d}g(x)}{\mathrm{d}x}$

Intégrale par parties :

$\int u\,\mathrm{d}v = uv - \int v\,\mathrm{d}u$