$$\oint_\sigma \mathrm{d}\mathbf{a}\cdot\mathbf{E} = Q_{enc}/\varepsilon_0$$
$$\nabla\cdot\mathbf{E} = \rho(\mathbf{r})/\varepsilon_0 \quad \nabla\times\mathbf{E}=0$$
$$V(\mathbf{r}) = -\int_{\infty/ref}^{\mathbf{r}} \mathrm{d}\hat{\ell}\cdot\mathbf{E}$$
$$\Delta V = \int_a^b \mathrm{d}\hat{\ell}\cdot\mathbf{E} \quad \mathbf{E} = -\nabla V - \frac{\partial\mathbf{A}}{\partial t}$$
$$C \equiv Q/V_{cap} \quad E_{plane} = \sigma/2\varepsilon_0$$
$$\mathbf{B}=\nabla\times\mathbf{A} \quad W_E = \frac{\varepsilon_0}{2}\int \mathrm{d}\tau E^2$$
$$\nabla\cdot\mathbf{B}=0 \quad \mathbf{F}=q(\mathbf{E}+\mathbf{v}\times\mathbf{B})$$
$$\mathbf{A}_{dp,m}(\mathbf{r}) = \frac{\mu_0}{4\pi}\frac{\mathbf{m}\times\mathbf{r}}{r^3}$$
$$\mathbf{B}_{dp,m}(\mathbf{r}) = \frac{\mu_0}{4\pi}\frac{3\mathbf{m}\cdot\hat{\mathbf{r}}\hat{\mathbf{r}}-\mathbf{m}}{r^3}$$
$$\mathbf{m}=\frac12\int \mathrm{d}\tau'\mathbf{r}'\times\mathbf{J}(\mathbf{r}')$$
$$\mathbf{m}=\frac12\sum_i q_i\mathbf{r}_i\times\mathbf{v}_i \quad \mathbf{p}=\sum_i q_i\mathbf{r}_i$$
$$\mathbf{m}_{loop} = I\mathbf{a} = I\frac12\int\mathbf{r}'\times\mathrm{d}\boldsymbol{\ell}'$$
$$\mathbf{A}=\frac12\mathbf{B}_{unif}\times\mathbf{r} \quad m\mathbf{v}=\mathbf{p}-q\mathbf{A}$$
$$\mathbf{F}=\nabla(\mathbf{m}\cdot\mathbf{B}) \quad \mathbf{D}=\varepsilon\mathbf{E}$$
$$\mathbf{N}=\mathbf{m}\times\mathbf{B} \quad \mathbf{M}\equiv\mathbf{m}/\mathrm{d}\tau$$
$$\oint\mathbf{B}\cdot\mathrm{d}\boldsymbol{\ell} = \mu_0 I_{enc}+\mu_0\varepsilon_0\int\frac{\partial\mathbf{E}}{\partial t}\cdot\mathrm{d}\mathbf{a}$$

$$\mathbf{J}=\frac{nq^2}{m\gamma}\mathbf{f}=\sigma_c\mathbf{f}\equiv\sigma_c\mathbf{E}$$
$$\varepsilon\equiv\oint\mathbf{f}\cdot\mathrm{d}\mathbf{l}\equiv\oint\mathbf{E}\cdot\mathrm{d}\mathbf{l}\equiv IR\equiv-\frac{\mathrm{d}\Phi_B}{\mathrm{d}t}$$
$$\Phi_B=\int\mathbf{B}\cdot\mathrm{d}\mathbf{a} \quad \nabla\times\mathbf{E}=-\frac{\partial\mathbf{B}}{\partial t}$$
$$\oint\mathrm{d}\boldsymbol{\ell}\cdot\mathbf{E} = -\frac{\mathrm{d}}{\mathrm{d}t}\int\mathrm{d}\mathbf{a}\cdot\mathbf{B} = -d\Phi_B/dt$$
$$\Phi_2 = MI_1 \quad I_1=I_2\Rightarrow\Phi_1=\Phi_2$$
$$\Phi=LI \quad \varepsilon=-L\frac{\mathrm{d}I}{\mathrm{d}t}$$
$$B^a_\perp - B^b_\perp = 0 \quad D^a_\perp - D^b_\perp=\sigma_f$$
$$E^a_\parallel - E^b_\parallel = 0 \quad \mathbf{H}^a_\parallel-\mathbf{H}^b_\parallel = \mathbf{K}_f\times\hat{\mathbf{n}}$$
$$\mathbf{S}=\frac{1}{\mu_0}(\mathbf{E}\times\mathbf{B}) \quad P=\int\mathbf{S}\cdot\mathrm{d}\mathbf{a}$$
$$\frac{\partial U}{\partial t}+\nabla\cdot\mathbf{S}=0 \quad \mathbf{p}_{eb}=\varepsilon_0\mathbf{E}\times\mathbf{B}$$
$$\frac{\partial}{\partial t}(\mathbf{p}_m+\mathbf{p}_{eb})+\nabla\cdot\overleftrightarrow{T}=0$$
$$T_{ij} = -U_{eb}\delta_{ij}+\varepsilon_0E_iE_j+\frac{1}{\mu_0}B_iB_j$$
$$F_i=\sum_j\oint\mathrm{d}a^jT_{ij}-\varepsilon_0\mu_0\frac{\mathrm{d}}{\mathrm{d}t}\int S_i\,\mathrm{d}\tau$$
$$\mathcal{L}_{eb}=\mathbf{r}\times\mathbf{p}_{eb} \quad W_B=\frac12LI^2$$
$$\equiv\frac12\int\mathrm{d}\tau\mathbf{J}\cdot\mathbf{A}\equiv\frac{1}{2\mu_0}\int\mathrm{d}\tau B^2$$

$$\mathbf{A}(\mathbf{r})=\frac{\mu_0}{4\pi}\int\mathrm{d}\tau'\mathbf{M}(\mathbf{r}')\times\frac{\hat{\boldsymbol{\mathscr{r}}}}{\mathscr{r}^2}$$
$$\mathbf{A}(\mathbf{r})=\frac{\mu_0}{4\pi}\int\mathrm{d}\tau'\frac{\mathbf{J}_b(\mathbf{r}')}{\mathscr{r}}$$
$$+\frac{\mu_0}{4\pi}\oint\mathrm{d}a'\frac{\mathbf{K}_b(\mathbf{r}')}{\mathscr{r}}$$
$$\mathbf{K}_b(\mathbf{r}')=\mathbf{M}\times\hat{\mathbf{n}}'$$
$$\mathbf{J}_b(\mathbf{r}')=\nabla'\times\mathbf{M}(\mathbf{r}')$$
$$\mathbf{H}=\frac{1}{\mu_0}\mathbf{B}-\mathbf{M}$$
$$\nabla\times\mathbf{H}=\mathbf{J}_f+\frac{\partial\mathbf{D}}{\partial t}$$
$$\oint\mathrm{d}\ell\cdot\mathbf{H}=I_{f,enc}=\int\mathrm{d}\mathbf{a}\cdot\mathbf{J}_f$$
$$\mathbf{M}=\chi_m\mathbf{H} \quad \mathbf{B}=\mu\mathbf{H}$$
$$\chi_{m,dia}=-\frac{n\mu_0}{6}\sum_i\frac{q_i^2}{m_i}r_i^2$$
$$B_s=\mu_0NI \quad B(r)_{tr}=\frac{\mu_0NI}{2\pi r}$$
$$\mathbf{F}=\int\mathrm{d}\tau[\rho\mathbf{E}+\mathbf{J}\times\mathbf{B}]$$
$$\nabla\times\mathbf{B}=\mu_0\mathbf{J}+\mu_0\varepsilon_0\frac{\partial\mathbf{E}}{\partial t}$$
$$U_{eb}=\frac12(\varepsilon_0E^2+\frac{1}{\mu_0}B^2)$$
$$\nabla\frac{1}{\mathscr{r}}=-\frac{\hat{\boldsymbol{\mathscr{r}}}}{\mathscr{r}^2} \quad \nabla\cdot\mathbf{D}=\rho_f$$

$$\left(\nabla^2-\frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right)\begin{pmatrix}\mathbf{E}\\ \mathbf{B}\end{pmatrix}=0 \quad n=\frac{c}{v}$$
$$\tilde{\mathbf{E}}=\tilde{\mathbf{E}}_0e^{i(kx-\omega t)} \quad \tilde{\mathbf{B}}=\tilde{\mathbf{B}}_0e^{i(kx-\omega t)}$$
$$\tilde{\mathbf{B}}=\frac1c\hat{\mathbf{x}}\times\tilde{\mathbf{E}} \quad \hat{\mathbf{n}}\equiv\cos\vartheta\hat{\mathbf{y}}+\sin\vartheta\hat{\mathbf{z}}$$
$$\tilde{\mathbf{E}}=\tilde{\mathbf{E}}_0e^{i(\mathbf{k}\cdot\mathbf{r}-\omega t)}\hat{\mathbf{n}} \quad v_k=\omega/k$$
$$\tilde{\mathbf{B}}=\frac1c\tilde{\mathbf{E}}_0e^{i(\mathbf{k}\cdot\mathbf{r}-\omega t)}\hat{\mathbf{x}}\times\hat{\mathbf{n}}=\frac1c\hat{\mathbf{x}}\times\tilde{\mathbf{E}}$$
$$\mathbf{E}=\mathrm{Re}\,\tilde{\mathbf{E}}=E_0\cos(kx-\omega t+\delta_E)\hat{\mathbf{y}}$$
$$\mathbf{B}=\frac{E_0}{c}\cos(kx-\omega t+\delta_B)\hat{\mathbf{z}} \quad \delta=\delta$$
$$S=cU_{eb} \quad \mathbf{p}_{eb}=\mathbf{S}/c^2=\hat{\mathbf{x}}U_{eb}/c$$
$$\langle U\rangle=\frac12\varepsilon_0E_0^2 \quad \langle\mathbf{S}\rangle=c\langle U\rangle\hat{\mathbf{x}}$$
$$\langle\mathbf{p}\rangle=\frac{\langle U\rangle}{c}\hat{\mathbf{x}} \quad I=\langle S\rangle=\frac12c\varepsilon_0E_0^2$$
$$\tilde{\mathbf{E}}_1=\tilde{\mathbf{E}}_I+\tilde{\mathbf{E}}_R \quad \tilde{\mathbf{E}}_2=\tilde{\mathbf{E}}_T$$
$$\frac{v_2}{v_1}=\frac{n_1}{n_2}=\frac{\sin\vartheta_T}{\sin\vartheta_I} \quad \alpha\equiv\frac{\cos\vartheta_T}{\cos\vartheta_I}$$
$$\beta\equiv\frac{\mu_1n_2}{\mu_2n_1} \quad \tilde{E}_0^T=\frac{2\tilde{E}_{0I}}{\alpha+\beta} \quad \tilde{E}_0^R=\frac{\alpha-\beta}{\alpha+\beta}\tilde{E}_0^I$$
$$\alpha^2=\beta^2\to\vartheta_I=\vartheta_B\to E_{0R}=0$$

$$\alpha=\frac{\sqrt{1-(n_1/n_2)^2\sin^2\vartheta_I}}{\cos\vartheta_I} \quad \mu_1\simeq\mu_2:$$
$$\sin^2\vartheta_B=\frac{\beta^2}{1+\beta^2} \quad \vartheta_B\simeq\tan^{-1}\frac{n_2}{n_1}$$
$$R=\frac{(\alpha-\beta)^2}{(\alpha+\beta)^2} \quad T=\alpha\beta\left(\frac{2}{\alpha+\beta}\right)^2$$
$$\sin\vartheta_c=\frac{n_2}{n_1}\equiv\frac{\sin\vartheta_I}{\sin\vartheta_T}$$
$$\cos\vartheta_T=i\sqrt{\left(\frac{\sin\vartheta_I}{\sin\vartheta_c}\right)^2-1}$$
$$\tilde{\varepsilon}=\varepsilon+\frac{i\sigma_c}{\omega} \quad \nabla\times\mathbf{B}=\tilde{\varepsilon}\mu\frac{\partial\mathbf{E}}{\partial t}$$
$$\tilde{k}=\omega\sqrt{\tilde{\varepsilon}\mu}=k_++ik_-$$
$$k_\pm=\omega\sqrt{\frac{\varepsilon\mu}{2}}\sqrt{\sqrt{1+\left(\frac{\sigma_c}{\omega\varepsilon}\right)^2}+1}$$
$$\langle\mathbf{S}\rangle_c=\hat{\mathbf{x}}\frac{k_+}{2\mu\omega}E_0^2e^{-2k_-x} \quad v_g=\frac{\mathrm{d}\omega}{\mathrm{d}k}$$
$$\frac{\mathrm{d}W}{\mathrm{d}t}=\int_V\mathrm{d}\tau\mathbf{J}\cdot\mathbf{E} \quad \tilde{\mathbf{p}}=q\tilde{\mathbf{r}}$$
$$(-\omega^2+\omega_0^2-i\gamma\omega)\tilde{\mathbf{r}}=\frac{q}{m}e^{-i\omega t}\tilde{\mathbf{E}}_0$$
$$n\simeq1+\frac12\frac{Nq^2}{m\varepsilon_0}\sum_i\frac{f_i(\omega_i^2-\omega^2)}{(\omega_i^2-\omega^2)^2+(i\gamma\omega)^2}$$

$$\left[\frac{\partial^2}{\partial y^2}+\frac{\partial^2}{\partial z^2}+\left(\frac{\omega}{c}\right)^2-k^2\right]\begin{pmatrix}E_x\\ B_x\end{pmatrix}=0$$
$$-\nabla^2G(\mathbf{r},\mathbf{r}')=4\pi\delta(\mathbf{r}-\mathbf{r}')$$
$$G(\mathbf{r},\mathbf{r}')=\int\frac{\mathrm{d}\mathbf{k}e^{i\mathbf{k}\cdot(\mathbf{r}-\mathbf{r}')}}{2\pi^2k^2}=\frac{1}{|\mathbf{r}-\mathbf{r}'|}$$
Lorenz: $\nabla\cdot\mathbf{A}+\frac{1}{c^2}\frac{\partial V}{\partial t}=0$
$$-\Box^2\begin{pmatrix}V\\ \mathbf{A}\end{pmatrix}=\begin{pmatrix}\rho/\varepsilon_0\\ \mu_0\mathbf{J}\end{pmatrix} \quad t_r=t-\frac{\mathscr{r}}{c}$$
$$G_{ret}=\frac{1}{\mathscr{r}}\delta\left(\frac{\mathscr{r}}{c}-(t-t')\right)$$
$$V=\int\mathrm{d}\tau'\frac{\rho(\mathbf{r}',t_r)}{4\pi\varepsilon_0\mathscr{r}} \quad \mathbf{A}=\int\mathrm{d}\tau'\frac{\mu_0\mathbf{J}(\mathbf{r}',t_r)}{4\pi\mathscr{r}}$$
$$\mathbf{B}=-\frac{\hat{\mathbf{r}}}{c}\frac{\mu_0}{4\pi r}\int\mathrm{d}\tau'\frac{\partial\mathbf{J}(\mathbf{r}',t_r)}{\partial t} \quad P=\frac{\mu_0q^2a^2}{6\pi c}$$
$$\frac{\mathrm{d}P}{\mathrm{d}\Omega}=\frac{\mu_0}{(4\pi)^2c}\left[\hat{\mathbf{r}}\times\int\mathrm{d}\tau'\frac{\partial\mathbf{J}(\mathbf{r}',t_r)}{\partial t}\right]^2$$
$$P=\frac{\mu_0}{6\pi c}\left[\ddot{p}^2(t_r)+\frac{1}{c^2}\ddot{m}^2(t_r)\right]$$
$$\begin{pmatrix}\mathbf{p}\\ \mathbf{m}\end{pmatrix}=\begin{pmatrix}p_0\\ m_0\end{pmatrix}\hat{\mathbf{z}}\cos\omega t$$

$$\gamma\equiv\frac{1}{\sqrt{1-v^2/c^2}} \quad x'=\gamma(x-vt)$$
$$y'=y \quad z'=z \quad t'=\gamma(t-\frac{v}{c^2}x)$$
$$u'_x=\frac{\mathrm{d}x'}{\mathrm{d}t'}=\frac{u_x-v}{1-vu_x/c^2}$$
$$u'_y=\frac{\mathrm{d}y'}{\mathrm{d}t'}=\frac{u_y}{\gamma(1-vu_x/c^2)}$$
$$u'_z=\frac{\mathrm{d}z'}{\mathrm{d}t'}=\frac{u_z}{\gamma(1-vu_x/c^2)}$$
$$\beta^{(\prime)}\equiv u_x^{(\prime)}/c \quad \beta_r=v/c$$
$$\beta=\tanh\vartheta$$
$$\vartheta=\vartheta'+\vartheta_r$$
$$\Delta x=\Delta x'\cosh\vartheta_r+c\Delta t'\sinh\vartheta_r$$
$$c\Delta t=c\Delta t'\cosh\vartheta_r+\Delta x\sinh\vartheta_r$$
$$\sinh\vartheta=\tanh\vartheta\cosh\vartheta$$
$$\vartheta\equiv\ i\tilde{\vartheta}:\sinh i\tilde{\vartheta}\equiv i\sin\tilde{\vartheta}$$
$$\cosh i\tilde{\vartheta}\equiv\cos\tilde{\vartheta} \quad T=ict$$
$$X=X'\cos\tilde{\vartheta}+T'\sin\tilde{\vartheta}$$
$$T=-X'\sin\tilde{\vartheta}+T\cos\tilde{\vartheta}$$

$$\mathrm{d}\tau\equiv\mathrm{d}t/\gamma \quad \beta\equiv v/c$$
$$x^\mu=(ct,x,y,z) \quad x_\mu=g_{\mu\nu}x^\nu$$
$$g_{\mu\nu}\equiv\eta_{\mu\nu}=\mathrm{diag}(-1,1,1,1)$$
$$\mathrm{d}s^2=-c^2\,\mathrm{d}t^2+\mathrm{d}x^2+\mathrm{d}y^2+\mathrm{d}z^2$$
$$x'^\mu=\Lambda^\mu_\nu x^\nu$$
$$\Lambda^\mu_\nu\equiv\begin{pmatrix}\gamma & -\gamma\beta & 0 & 0\\ -\gamma\beta & \gamma & 0 & 0\\ 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 1\end{pmatrix}$$
$$\partial_\mu\equiv\frac{\partial}{\partial x^\mu} \quad \partial^\mu\equiv\frac{\partial}{\partial x_\mu}$$
$$F'^{\mu\nu}=\Lambda^\mu_\kappa\Lambda^\nu_\lambda F^{\kappa\lambda} \quad \mathrm{d}s^2=-c^2\,\mathrm{d}\tau^2$$
$$\eta^\mu=\frac{\mathrm{d}x^\mu}{\mathrm{d}\tau} \quad \eta=\eta^\mu\eta_\mu=-c^2$$
$$p^\mu\equiv m\eta^\mu \quad p^0=E/c \quad E=\gamma mc^2$$
$$p^2=p^ip_i \quad E^2=p^2c^2+m^2c^4$$
$$\sum_ip_i^\mu=\sum_jp_j^\nu \quad J^\mu\equiv(c\rho,\vec{J})$$
$$F^{\mu\nu}\equiv\partial^\mu A^\nu-\partial^\nu A^\mu \quad \partial_\mu J^\mu=0$$
$$A^\mu=(V/c,\vec{A}) \quad F^{ij}=\varepsilon^{ijk}B_k$$

$$B_i=\partial_jA_k-\partial_kA_j \quad F^{\mu\mu}=0$$
$$F^{0i}=E^i/c \quad \varepsilon^{123}\equiv1 \quad F^{\mu\nu}=-F^{\nu\mu}$$
$$F^{\mu\nu}\equiv\begin{pmatrix}0 & E_x/c & E_y/c & E_z/c\\ -E_x/c & 0 & B_z & -B_y\\ -E_y/c & -B_z & 0 & B_x\\ -E_z/c & B_y & -B_x & 0\end{pmatrix}$$
$$G^{\mu\nu}\equiv\begin{pmatrix}0 & B_x & B_y & B_z\\ -B_x & 0 & -E_z/c & E_y/c\\ -B_y & E_z/c & 0 & -E_x/c\\ -B_z & -E_y/c & E_x/c & 0\end{pmatrix}$$
$$\vec{E}\to c\vec{B} \quad \vec{B}\to-\vec{E}/c \quad G^{\mu\nu}=\frac12\varepsilon^{\mu\nu\alpha\beta}F_{\alpha\beta}$$
$$\partial_\nu F^{\mu\nu}=\mu_0J^\mu \quad \partial_\nu G^{\mu\nu}=0$$
$$B'_3=\gamma(b_3-\frac{v}{c^2}E_2) \quad B'_2=\gamma(B_2+\frac{v}{c^2}E_3)$$
$$E'_x=E_x \quad B'_x=B_x \quad -\partial^\mu\partial_\mu A^\nu=\mu_0J^\nu$$