Electroestática

$$\boldsymbol{F} = q(\boldsymbol{E} + \boldsymbol{v} \times \boldsymbol{B}) \tag{1}$$

$$\boldsymbol{\nabla} \cdot \boldsymbol{E}(\boldsymbol{r}, t) = \frac{1}{\varepsilon_0}\rho(\boldsymbol{r}, t) \qquad \text{Lei de Coulomb ou de Gauss} \tag{2a}$$

$$\boldsymbol{\nabla} \cdot \boldsymbol{B}(\boldsymbol{r}, t) = 0 \tag{2b}$$

$$\boldsymbol{\nabla} \times \boldsymbol{E}(\boldsymbol{r}, t) = -\frac{\partial}{\partial t}\boldsymbol{B}(\boldsymbol{r}, t) \qquad \text{Lei de Faraday} \tag{2c}$$

$$\boldsymbol{\nabla} \times \boldsymbol{B}(\boldsymbol{r}, t) = \frac{1}{c^2}\frac{\partial}{\partial t}\boldsymbol{E}(\boldsymbol{r}, t) + \frac{1}{\varepsilon_0 c^2}\boldsymbol{j}(\boldsymbol{r}, t) \qquad \text{Lei de Ampére} \tag{2d}$$

$$c^2 = \frac{1}{\varepsilon_0 \mu_0} \tag{3}$$

$$\oint_S \boldsymbol{E} \cdot d\boldsymbol{a} = \frac{1}{\varepsilon_0}\int_V \rho(\boldsymbol{r}, t) d\boldsymbol{v} = \frac{Q}{\varepsilon_0} \tag{4a}$$

$$\oint_S \boldsymbol{B} \cdot d\boldsymbol{a} = 0 \tag{4b}$$

$$\oint_C \boldsymbol{E} \cdot d\boldsymbol{l} = -\frac{d}{dt}\int_S \boldsymbol{B}(\boldsymbol{r}, t) \cdot d\boldsymbol{a} \tag{4c}$$

$$\oint_C \boldsymbol{B} \cdot d\boldsymbol{l} = \frac{1}{c^2}\int_S \left(\frac{1}{\varepsilon_0}\boldsymbol{j}(\boldsymbol{r}, t) + \frac{\partial}{\partial t}\boldsymbol{E}(\boldsymbol{r}, t)\right) \cdot d\boldsymbol{a} \tag{4d}$$

$$\boldsymbol{B} = \boldsymbol{\nabla} \times \boldsymbol{A} \tag{5}$$

$$\boldsymbol{E} = -\boldsymbol{\nabla} V - \frac{\partial}{\partial t}\boldsymbol{A} \tag{6}$$

$$\boldsymbol{\nabla} \cdot \boldsymbol{j} + \frac{\partial \rho}{\partial t} = 0 \tag{7}$$

$$\boldsymbol{E}(\boldsymbol{r}) = \frac{1}{4\pi\varepsilon_0}\sum_i^N q_i \frac{\boldsymbol{r} - \boldsymbol{r}_i}{|\boldsymbol{r} - \boldsymbol{r}_i|^3} \tag{8}$$

$$\boldsymbol{E}(\boldsymbol{r}) = \frac{1}{4\pi\varepsilon_0}\int \frac{\boldsymbol{r} - \boldsymbol{r}'}{|\boldsymbol{r} - \boldsymbol{r}'|^3} dq \tag{9}$$

$$dq = \lambda dl' \tag{10}$$

$$dq = \sigma da' \tag{11}$$

$$dq = \rho dv' \tag{12}$$

$$\boldsymbol{\nabla}^2 V = -\frac{\rho}{\varepsilon_0} \tag{13}$$

$$V(\boldsymbol{r}) = -\int_O^{\boldsymbol{r}} \boldsymbol{E}(\boldsymbol{r}') \cdot d\boldsymbol{l}' \tag{14}$$

$$V(\boldsymbol{r}) = \frac{1}{4\pi\varepsilon_0} \sum_i^N \frac{q_i}{|\boldsymbol{r} - \boldsymbol{r}_i|} \tag{15}$$

$$V(\boldsymbol{r}) = \frac{1}{4\pi\varepsilon_0} \int_V \frac{\rho(\boldsymbol{r'})}{|\boldsymbol{r} - \boldsymbol{r'}|} dv' \tag{16}$$

$$\boldsymbol{E}_+ - \boldsymbol{E}_- = \frac{\sigma}{\varepsilon_0} \boldsymbol{n} \tag{17}$$

$$W = \frac{1}{2} \sum_{i=1}^N q_i \left(\frac{1}{4\pi\varepsilon_0} \sum_{j=1,\neq i}^N \frac{q_j}{r_{ij}} \right) = \frac{1}{2} \sum_{i=1}^N q_i V(\boldsymbol{r}_i) \tag{18}$$

$$W = \frac{1}{2} \int \rho(\boldsymbol{r}) V(\boldsymbol{r}) d\boldsymbol{v} \tag{19}$$

$$W = \frac{\varepsilon_0}{2} \int E^2 d\boldsymbol{v} \tag{20}$$

$$\boldsymbol{p} = q\boldsymbol{d} \tag{21}$$

$$V = \frac{1}{4\pi\varepsilon_0} \frac{\boldsymbol{p} \cdot \hat{\boldsymbol{r}}}{r^2} \tag{22}$$

$$\boldsymbol{p} = \int_V \rho(\boldsymbol{r'}) \boldsymbol{r'} dv' \tag{23}$$