

Electricidad y Magnetismo

Constantes Fundamentales

$$c = \text{Velocidad de la luz} = 3.00 \times 10^8 \text{ ms}^{-1}$$

$$k = \text{Constante de Coulomb} = 8.9876 \times 10^9 \text{ Nm}^2\text{C}^{-2}$$

$$\epsilon_o = \text{Constante dieléctrica vacío} = 8.85 \times 10^{-12} \text{ N}^{-1}\text{C}^2\text{m}^{-2} \text{ (m/F)}$$

$$\mu_o = \text{Permeabilidad del vacío} = 4\pi \times 10^{-7} \text{ H/m} = 1.256 \times 10^{-6} \text{ Kgs}^{-2}\text{A}^{-2}$$

$$e^\pm = \text{Carga del electrón-protón} = 1.60 \times 10^{-19} \text{ C}$$

$$m_e = \text{Masa del electrón} = 9.11 \times 10^{-31} \text{ kg}$$

$$m_n = \text{Masa de neutrón-protón} = 1.67 \times 10^{-27} \text{ kg}$$

$$N_A = \text{Número de Avogadro} = 6.022 \times 10^{23} \text{ moléculas/mol}$$

$$k_B = \text{Constante de Boltzmann} = 1.38 \times 10^{-23} \text{ J/K}$$

Distribuciones Discretas

$$\vec{F}_{ij} = k \frac{Q_i Q_j}{r_{ij}^2} \hat{r}_{ij} = \frac{1}{4\pi\epsilon_o} \frac{Q_i Q_j}{r_{ij}^2} \hat{r}_{ij} = Q_i \vec{E}_j$$

$$\vec{E}_i = k \frac{Q_i}{r_{io}^2} \hat{r}_{io}$$

$$V = k \frac{Q_i}{r_{oi}}$$

Densidad de Carga

$$\lambda = \frac{q}{L} = \frac{dq}{dL}, dq = \lambda dL$$

$$\sigma = \frac{q}{A} = \frac{dq}{dA}, dq = \sigma dA$$

$$\rho = \frac{q}{V} = \frac{dq}{dV}, dq = \rho dV$$

Distribuciones Continuas

Campo

$$d\vec{E} = k \frac{dq}{r_{do}^2} \hat{r}_{do}$$

$$\vec{E} = k \int \frac{\lambda dL}{r_{do}^2} \hat{r}_{do}, \vec{E} = k \int \frac{\sigma dA}{r_{do}^2} \hat{r}_{do}, \vec{E} = k \int \frac{\rho dV}{r_{do}^2} \hat{r}_{do}$$

$$\vec{E}_{\text{linea}} = \frac{1}{2\pi\epsilon_o} \frac{\lambda}{r} \hat{r}$$

$$\vec{E}_{\text{placa}} = \frac{\sigma}{2\epsilon_o} \hat{r}_\perp$$

$$\text{Entre placas opuestas } \vec{E}_{\text{placas}} = \frac{\sigma}{\epsilon_o} \hat{r}_\perp$$

$$E_i = -\frac{dV}{dx_i}; x_i = x, y, z$$

$$\vec{E} = -\vec{\nabla}V$$

Distribuciones Continuas

Gauss

$$\Phi = \oint \vec{E} \cdot d\vec{A} = \frac{q_{enc}}{\epsilon_o}$$

Potencial

$$V = \frac{U}{q}$$

$$V = \vec{E} \cdot \vec{r}$$

$$V - V_o = - \int \vec{E} \cdot d\vec{l}$$

$$V = \frac{1}{4\pi\epsilon_o} \int \frac{dq}{r}$$

$$V = k \int \frac{\lambda dL}{r_{do}}, V = k \int \frac{\sigma dA}{r_{do}}, V = k \int \frac{\rho dV}{r_{do}}$$

Energía

$$\Delta U = - \int_a^b \vec{F} d\vec{l} = -q \int_a^b \vec{E} d\vec{l}$$

$$\Delta U = q\Delta V = -W_{ab} = qEl$$

Capacitancia

$$C_o \frac{q}{V} = \frac{\epsilon_o A}{d}, \text{ con dieléctrico } C = kC_o = \frac{k\epsilon_o A}{d}$$

$$C_p = C_1 + C_2 + \dots + C_n = \sum_i^n C_i$$

$$C_s = 1/C_1 + 1/C_2 + \dots + 1/C_n = (\sum_i^n \frac{1}{C_i})^{-1}$$

$$E_{\text{pot-elec}} = U = \frac{1}{2}qV = \frac{q^2}{2C} = \frac{1}{2}CV^2$$

$$\mu = \frac{\epsilon_o E^2}{2} = \frac{\epsilon_o V^2}{2d^2} = \frac{U}{\text{Volumen}}$$

Corriente

$$I = \frac{V}{R} = \frac{\Delta q}{\Delta t} = \frac{dq}{dt} = JA = \int \vec{J} \cdot \vec{A}$$

$$v_d = \frac{I}{nAe} = \frac{J}{ne} = a\tau = \frac{eE\lambda}{m}$$

$$R = \rho \frac{L}{A}, \rho = \frac{E}{J} = \frac{1}{\sigma} = \frac{m_e}{ne^2\tau}, \vec{J} = \sigma \vec{E} = -nev_d$$

$$R_s = R_1 + R_2 + \dots + R_n = \sum_i^n R_i$$

$$R_p = 1/R_1 + 1/R_2 + \dots + 1/R_n = (\sum_i^n \frac{1}{R_i})^{-1}$$

$$P = IV = I^2 R = \frac{V^2}{R} = \frac{dU}{dt}, dU = dqV_{ab} = IdtV_{ab}$$

Fuentes Campo Magnético

$$F = \frac{\mu_o}{2\pi} \frac{qvI}{r}$$

$$\vec{F} = q\vec{v} \times \vec{B}, F = qvB \sin\theta$$

$$B = \frac{\mu_o I}{2\pi r}$$

$$\vec{F} = q\vec{E} + q\vec{v} \times \vec{B}$$

$$B = n\mu_o I$$

$$\vec{F} = i\vec{l} \times \vec{B}$$

Cargas en Movimiento con Presencia de Campos

Biot-Savart

$$d\vec{B} = \frac{\mu_o}{4\pi} \frac{Id\vec{l} \times \vec{r}}{r^3}$$

$$B = \frac{\mu_o I}{4\pi R^2} \Delta l_{arcco}$$

$$B = \frac{\mu_o I}{4\pi R} (\cos\theta_1 - \cos\theta_2)$$

Cargas en Movimiento

$$r = \frac{mv}{qB}$$

$$a = \frac{qvB}{m} = \frac{v^2}{r}$$