# Electricidad y Magnetismo

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Campo

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

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

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

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

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

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

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

## 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

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

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

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

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

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

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

$\mu = \frac{\epsilon_o E^2}{2} = \frac{\epsilon_o V^2}{2d^2} = \frac{U}{V_{olumen}}$

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

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

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

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

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

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

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

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

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

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

$B = n\mu_o I$

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

## Biot-Savart

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

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

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

## Cargas en Movimiento

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

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