Field and Particle Pictures

Electromagnetic Machines

$$\varepsilon = -N\frac{d\phi}{dt} \quad N\phi \propto \int \varepsilon dt \quad Vs/Vp = Ns/Np \quad \Lambda = \frac{\phi}{NI} = \frac{\mu A}{L} \quad B = \frac{\phi}{A} = \frac{\mu NI}{L} = \mu nI$$

Charge and Field

$$\frac{1}{2}mv^2 = qV \quad E_{rest} = mc^2 \quad E_{total} = pc \quad E = \frac{F}{q} = \frac{dV}{dx} \quad V = \frac{EPE}{q}$$

$$F = ILB = BqV \quad \frac{mv^2}{r} = BqV \quad r = \frac{p}{qB} \quad E = \frac{q}{4\pi\varepsilon_0 r^2} \quad V = \frac{q}{4\pi\varepsilon_0 r} \quad F = \frac{q_1 q_2}{4\pi\varepsilon_0 r^2}$$

Probing Deep into Matter

$$\lambda = \frac{h}{p} \approx \frac{hc}{E} \quad E_K = \frac{h^2}{2m\lambda^2} \quad E_n \propto \frac{1}{n^2} \quad E = hf = \frac{hc}{\lambda}$$

Ionising Radiation and Risk

$$x_{1/2} = \frac{\ln 2}{\mu} \quad I = I_o e^{-\mu x}$$

Definitions of Terms

EMF or potential, ε or V, V; Number of Turns, N, Ns or Np; Flux, ϕ, Wb; Time, t, s; Permeance, Λ, Wb A^{-1}; Current, I, A; Permeability, μ, Wb A^{-1} m^{-1}; Area, A, m^2; Length, L, m; Flux Density, B, Wb m^{-2}; Turns per Meter, n; Mass, m, Kg; Velocity, v, ms^{-1}; Charge, q, C; Energy, E, J; Speed of Light, c = 3 x 10^8, ms^{-1}; Momentum, p , Ns or Kg ms^{-1}; Force, F, N; Distance, x or r, m; Electrical Potential Energy, EPE, J; Permittivity of Free Space, ε_0 = 8.85 x 10^{-12}, C^2 N^{-1} m^{-2}; Wavelength, λ, m; Planck's Constant, h = 6.6 x 10^{-34}, Js; Frequency, f, Hz; Half Thickness, $x_{1/2}$, m; Intensity, I.

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