Possibly Useful Information

Constants & Conversions:

g = 9.81 m/s^2 $\quad e = 1.60\times10^{-19}$ C $\quad \varepsilon_0 = 8.85\times10^{-12}\ \frac{\text{C}^2}{\text{Nm}^2}$

$k = \frac{1}{4\pi\varepsilon_0} = 8.99\times10^9\ \frac{\text{Nm}^2}{\text{C}^2}$ $\quad \mu_0 = 4\pi\times10^{-7}\ \frac{\text{T}\cdot\text{m}}{\text{A}}$ $\quad c = 3.0\times10^8\ \frac{\text{m}}{\text{s}}$

1 eV = 1.602×10^{-19} J $\quad$ 1 V = 1 J/C= 1N·m/C $\quad$ 1 W = 1 J/s

1 A = 1 $\frac{\text{C}}{\text{s}}$ $\quad$ 1 T = 1 $\frac{\text{N}}{\text{A}\cdot\text{m}}$ $\quad$ 1 H = $\frac{\text{T}\cdot\text{m}^2}{\text{A}}$ = 1 Ω·s $\quad$ 1 F = 1 $\frac{\text{C}}{\text{V}}$ = 1 $\frac{\text{s}}{\Omega}$

$m_p = 1.67\times10^{-27}$ kg $\quad m_e = 9.11\times10^{-31}$ kg

$C = 2\pi r$ $\quad A = \pi r^2$ $\quad A = 4\pi r^2$ $\quad V = (4/3)\pi r^3$

Current, Resistance & Circuits:

$$I = \frac{dq}{dt} \qquad I = \int \vec{J}\cdot d\vec{A} \qquad I = JA \qquad \vec{J} = ne\vec{v}_d \qquad \vec{E} = \rho\vec{J}$$

$$R = \frac{V}{I} \qquad \sigma = \frac{1}{\rho} \qquad R = \frac{\rho L}{A} \qquad \rho - \rho_0 = \rho_0\alpha(T - T_0)$$

$$P = IV = I^2R = \frac{V^2}{R} \qquad P = \frac{\Delta E}{\Delta t} \qquad \mathcal{E} = \frac{dW}{dq} \qquad U = q\Delta V$$

$$R_{eq} = \sum_{j=1}^{n} R_j \qquad \frac{1}{R_{eq}} = \sum_{j=1}^{n}\frac{1}{R_j} \qquad \Delta V_{loop} = 0 \qquad \sum I_{junc} = 0$$

$$I = \left(\frac{\mathcal{E}}{R}\right)e^{-t/RC} \qquad V_C = \mathcal{E}\left(1 - e^{-t/RC}\right) \qquad q = q_0e^{-t/RC} \qquad I = -\left(\frac{q_0}{RC}\right)e^{-t/RC} \qquad \tau_C = RC$$

Magnetic Fields:

$$\vec{F}_B = q\vec{v}\times\vec{B} \qquad F_B = \frac{mv^2}{r} \qquad \vec{F}_B = I\vec{L}\times\vec{B}$$

$$\mu = NIA \qquad \vec{\tau} = \vec{\mu}\times\vec{B} \qquad U(\theta) = -\vec{\mu}\cdot\vec{B}$$

$$d\vec{B} = \frac{\mu_0}{4\pi}\frac{Id\vec{s}\times\hat{r}}{r^2} \qquad \oint\vec{B}\cdot d\vec{s} = \mu_0 I_{enc} \qquad \Phi_B = \int\vec{B}\cdot d\vec{A}$$

$$B = \frac{\mu_0 I}{2\pi r} \qquad B = \frac{\mu_0 I\phi}{4\pi R} \qquad B = \mu_0 nI \qquad B = \frac{\mu_0 IN}{2\pi r} \qquad B = \frac{\mu_0 IR^2}{2\left(R^2 + x^2\right)^{3/2}}$$

Magnetic Induction:

$$\mathcal{E} = -\frac{d\Phi_B}{dt} \qquad \oint\vec{E}\cdot d\vec{s} = -\frac{d\Phi_B}{dt} \qquad L = \frac{N\Phi_B}{I} \qquad \mathcal{E}_L = -L\frac{dI}{dt}$$

$$I = \frac{\mathcal{E}}{R}\left(1 - e^{-t/\tau_L}\right) \qquad I = I_0e^{-t/\tau_L} \qquad \tau_L = \frac{L}{R}$$

$$U_B = \frac{1}{2}LI^2 \qquad u_B = \frac{B^2}{2\mu_0} \qquad \oint\vec{B}\cdot d\vec{A} = 0$$

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LC Oscillations:

$$\omega^2 = \frac{1}{LC} \qquad V = V_{\max} \sin(\omega t + \phi_V) \qquad I = I_{\max} \sin(\omega t + \phi_I)$$

$$q = q_{\max} \cos(\omega t + \phi) \qquad q = q_{\max} e^{-Rt/2L} \cos(\omega' t + \phi) \qquad \omega' = \sqrt{\omega^2 - (R/2L)^2}$$

$$X_C = \frac{1}{\omega_d C} \qquad X_L = \omega_d L \qquad V_R = I_R R \qquad V_C = I_C X_C \qquad V_L = I_L X_L$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2} \qquad \varepsilon = \varepsilon_{\max} \sin \omega_d t \qquad I = I_{\max} \sin(\omega_d t - \phi)$$

$$I_{\max} = \frac{\varepsilon_{\max}}{Z} \qquad \tan\phi = \frac{X_L - X_C}{R} \qquad I_{rms} = \frac{I_{\max}}{\sqrt{2}} \qquad \varepsilon_{rms} = \frac{\varepsilon_{\max}}{\sqrt{2}}$$

$$P_{ave} = I_{rms}^2 R \qquad P_{ave} = I_{rms}^2 R = \varepsilon_{rms} I_{rms} \cos\phi$$

$$\frac{V_{prim}}{N_{prim}} = \frac{V_{\sec}}{N_{\sec}} \qquad I_{prim} N_{prim} = I_{\sec} N_{\sec} \qquad R_{eq} = \left(\frac{N_{prim}}{N_{\sec}}\right)^2 R$$

EM Waves:

$$\Phi_B = \oint \vec{B} \cdot d\vec{A} = 0 \qquad \oint \vec{B} \cdot d\vec{s} = \mu_0 \varepsilon_0 \frac{d\Phi_E}{dt} + \mu_0 I_{enc} \qquad I_d = \varepsilon_0 \frac{d\Phi_E}{dt}$$

$$E = E_{\max} \sin(kx - \omega t) \qquad B = B_{\max} \sin(kx - \omega t)$$

$$\frac{E}{B} = c \qquad c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} \qquad \vec{S} = \frac{1}{\mu_0} \vec{E} \times \vec{B}$$

$$I_{\text{point}} = \frac{P}{4\pi r^2} \qquad I = \left|\vec{S}_{av}\right| = \frac{E_{\max} B_{\max}}{2\mu_0} \qquad F = \frac{IA}{c} \qquad F = \frac{2IA}{c} \qquad p = \frac{F}{A}$$

$$I = \frac{1}{2} I_0 \qquad I = I_0 \cos^2\theta$$