

USEFUL FORMULÆ AND CONSTANTS

Electrical forces

$$\vec{F} = \sum \vec{F}_{All \text{ Sources}} \qquad F = \frac{kQ_1Q_2}{r^2}$$

Electric Fields

$$\vec{E} = \sum \vec{E}_{All \text{ Sources}} \qquad E = \frac{kQ}{r^2} \qquad \vec{F} = q\vec{E}$$

Electric Potentials

$$V = \sum V_{All \text{ Sources}} \qquad V = \frac{kQ}{r} \qquad PE = qV \qquad E_{\parallel} d = -\Delta V$$

Energy

$$\Delta KE + \Delta PE = 0 \qquad W = \Delta KE = -\Delta PE$$

Capacitors

$$Q = CV \qquad C = \kappa\epsilon_0 \frac{A}{d} \qquad E = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}Q^2/C$$

Resistors

$$V = IR \qquad R = \rho \frac{l}{A} \qquad Power = IV = \frac{V^2}{R} = I^2R$$

Equivalent Circuits

$$R_{parallel} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \dots \right)^{-1} \qquad R_{series} = R_1 + R_2 + \dots$$

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Magnetism and Magnetic Forces

$$F = qvB_{\perp} \quad F = I l B_{\perp} \quad F = \frac{\mu_0}{2\pi} \frac{I_1 I_2 l}{d} \quad F_{centripetal} = \frac{mv^2}{r}$$

$$B = \frac{\mu_0}{2\pi} \frac{I}{r} \quad B = \frac{N\mu_0}{2} \frac{I}{R} \quad \tau = NIAB \sin\theta$$

Magnetic Induction

$$EMF = -\frac{\Delta\phi_{total}}{\Delta t} \quad EMF = NAB \omega \sin(\omega t)$$

$$V_2/V_1 = N_2/N_1 \quad I_1 V_1 = I_2 V_2$$

Simple Harmonic Motion

$$F = -kx \quad \omega = 2\pi f = 2\pi/T \quad \omega = \sqrt{\frac{k}{m}} \quad \omega = \sqrt{\frac{g}{L}} \quad E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2$$

$$x(t) = A \sin(\omega t) \quad v(t) = A\omega \cos(\omega t) \quad a(t) = -A\omega^2 \sin(\omega t)$$

Waves

$$v = \lambda f$$

mirrors and lenses

$$f = r/2 \quad \frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f} \quad m = \frac{h_i}{h_o} = -\frac{d_i}{d_o}$$

Refraction

$$n = c/v_{material} \quad n_1 \sin\theta_1 = n_2 \sin\theta_2$$