1444 Test I Eq. Sheet

$|F|=\sqrt{(F_x^2+F_y^2)}$

$\theta = \tan^{-1}(F_y/F_x)$

Electron charge:

$e = 1.602\times 10^{-19}\,C$

Electron mass: $m_e = 9.1\text{x}10^{-31}$ kg

Proton mass: $m_p = 1.67\text{x}10^{-27}$ kg

Colomb's Law:

$$F = k\frac{Q_1 Q_2}{r^2} \qquad k = 8.988\times 10^9 \ \ \mathrm{N\cdot m^2}/C^2$$

$$\varepsilon_0 = 1/4\pi k = 8.85\times 10^{-12}\ C^2/N\cdot m^2$$

Dipole: $\vec{\tau} = \vec{p}\times\vec{E}$ $\quad U = -\vec{p}\cdot\vec{E}$

Flux: $\Phi_E = \int \vec{E}\cdot d\vec{A}$

Gauss Law: $\oint \vec{E}\cdot d\vec{A} = \frac{Q_{encl}}{\varepsilon_0}$

Electric Field: $\vec{E} = \frac{\vec{F}}{q}$ $\quad E_l = -\frac{dV}{dl}$

For a point charge: $|E| = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}$

$$V = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r} \qquad \mathrm{V} = -\int \vec{E}\cdot d\vec{l}$$

V=Ed (uniform field)

Eqs. of motion:

$$v_{xf} = v_{xi} + a_x t$$

$$x_f = x_i + v_{xi}t + \frac{1}{2}a_x t^2$$

$$v^2 = v_0^2 + 2ax$$

K.E.=$mv^2/2$

Ugrav=mgh g=9.8 m/s^2

Uelec=qV

Q=CV C=capacitance

parallel plate: $C = \kappa\frac{\varepsilon_0 A}{d}$

dielectric: $\kappa \geq 1$

Cap. stored energy: $U = \frac{Q^2}{2C}$

Ohm's Law: V=IR

Power: P=IV

Current: I=q/t

AC: $V = V_0 \sin 2\pi f t$

Resistivity: $R = \rho\frac{l}{A}$ $\quad \sigma = \frac{1}{\rho}$

$$\rho_T = \rho_0\left[1+\alpha\ \ T - T_0\ \ \right]$$

$C_{eq}=C_1+C_2$ (parallel)

$1/C_{eq}=1/C_1+1/C_2$ (series)

1444 Test 2 Eq. Sheet

$$V_{ab} = \varepsilon - Ir$$

Terminal voltage

$$R_{eq} = \sum_i R_i$$

Resistors in series

$$\frac{1}{R_{eq}} = \sum_i \frac{1}{R_i}$$

Resistors in parallel

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

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

$$\tau = NIAB \sin\theta$$

$$\vec{\mu} = NI\vec{A}$$

Magnetic dipole

$$U = -\mu B \cos\theta = -\vec{\mu} \cdot \vec{B}$$

$$B = \frac{\mu_0 I}{2\pi r}$$

Magnetic field from long straight wire

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I_{encl}$$

Ampére's Law

$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{d\vec{l} \times \hat{r}}{r^2}$$

Biot-Savart Law

$$V_{rms} = I_{rms} X_L$$

$$M_{21} = N_2 \Phi_{21} / I_1$$

Mutual (M) and self (L) Inductance

$$\varepsilon_2 = -M_{21} \frac{dI_1}{dt}$$

$$\varepsilon = -N \frac{d\Phi_B}{dt}$$

Faraday's Law

$$L = \frac{N\Phi_B}{I}$$

Flux

$$\Phi_B = BA\cos\theta = \vec{B} \cdot \vec{A}$$

Solenoid

$$B = \mu_0 nI$$

transformer

$$\frac{I_S}{I_P} = \frac{V_P}{V_S} = \frac{N_P}{N_S}$$