Possibly Useful Information

Constants & Conversions:

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

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

1 V = 1 J/C = 1 Nm/C $\quad$ 1 W = 1 J/s $\quad$ 1 A = 1 C/s $\quad$ 1 F = 1 C/V = 1s/Ω

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

$C = 2\pi r$ $\quad$ $A = \pi r^2$ $\quad$ $A = 4\pi r^2$ $\quad$ $V = (4/3)\pi r^3$ $\quad$ 180^o in Δ

Electric Force and Electric Fields:

$\vec{F}_{12} = \frac{kq_1q_2}{r^2}\hat{r}$ $\quad$ $q = Ne$ $\quad$ $\vec{F} = q\vec{E}$ $\quad$ $\vec{E} = \frac{kq}{r^2}\hat{r}$

$\vec{E} = \sum_i \vec{E}_i = \sum_i \frac{kq_i}{r_i^2}\hat{r}_i$ $\quad$ $\vec{E} = \int d\vec{E} = \int \frac{kdq}{r^2}\hat{r}$

$\vec{p} = q\vec{d}$ $\quad$ $\vec{\tau} = \vec{p}\times\vec{E}$ $\quad$ $U = -\vec{p}\cdot\vec{E}$

$\Phi = \int \vec{E}\cdot d\vec{A}$ $\quad$ $\oint \vec{E}\cdot d\vec{A} = \frac{q_{enc}}{\varepsilon_0}$

$E = \frac{q}{4\pi\varepsilon_0 r^2}$ $\quad$ $E = \frac{\lambda}{2\pi\varepsilon_0 r}$ $\quad$ $E = \frac{\sigma}{2\varepsilon_0}$ $\quad$ $E_{cond} = \frac{\sigma}{\varepsilon_0}$

$\lambda = \frac{Q}{L} = \frac{dq}{d\ell}$ $\quad$ $\sigma = \frac{Q}{A} = \frac{dq}{dA}$ $\quad$ $\rho = \frac{Q}{V} = \frac{dq}{dV}$

Electric Fields and Potentials:

$\Delta U = U_f - U_i = -W_{field}$ $\quad$ $U = \frac{kq_1q_2}{r}$ $\quad$ $V = \frac{kq}{r}$

$V = \sum_i V_i = \sum_i \frac{kq_i}{r_i}$ $\quad$ $V = \int dV = \int \frac{kdq}{r}$

$\Delta V = V_f - V_i = -\frac{W_{firld}}{q} = -\int_i^f \vec{E}\cdot d\vec{s}$ $\quad$ $\vec{E} = -\nabla V = -\left(\frac{\partial V}{\partial x}\hat{i} + \frac{\partial V}{\partial y}\hat{j} + \frac{\partial V}{\partial z}\hat{k}\right)$

Capacitance:

$q = C\Delta V$ $\quad$ $C = \frac{\varepsilon_0 A}{d}$ $\quad$ $C = 2\pi\varepsilon_0 \frac{L}{\ln(b/a)}$ $\quad$ $C = 4\pi\varepsilon_0 \frac{ab}{b-a}$

$C = 4\pi\varepsilon_0 R$ $\quad$ $C_{eq} = \sum_{j=1}^{n} C_j$ $\quad$ $\frac{1}{C_{eq}} = \sum_{j=1}^{n}\frac{1}{C_j}$

$U = \frac{q^2}{2C} = \frac{1}{2}C(\Delta V)^2$ $\quad$ $u = \frac{1}{2}\varepsilon_0 E^2$ $\quad$ $C = \kappa C_0$ $\quad$ $\varepsilon_0\oint \kappa\vec{E}\cdot d\vec{A} = q$

Possibly Useful Information

Current, Resistance & Circuits:

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

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

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

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

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