Potential energy, potentials and potential differences: $U_{ab} = U_b - U_a = -W_{ab} = -\int_a^b \vec{F} \cdot d\vec{l}$;

$V_{ab} = V_b - V_a = -\int_a^b \vec{E} \cdot d\vec{l}$; Volt $[V] = [J/C]$; $V = k\dfrac{Q}{r}$; $V = k\int \dfrac{dq}{r}$; $E_l = -\dfrac{dV}{dl}$;

$E_x = -\dfrac{\partial V}{\partial x}$; $U_{12} = k\dfrac{Q_1 Q_2}{r_{12}}$.

Ohm's law: $I = \dfrac{V}{R}$, $I = \dfrac{\Delta Q}{\Delta t}$. Resistance vs. resistivity: $R = \rho \dfrac{L}{A}$; $\rho = \rho_0[1 + \alpha(T - T_0)]$.

Power: $P = VI = V^2/R = I^2 R$. Alternating current: $V = V_0 \sin \omega t$; $P = V_0^2/R \cdot \sin^2(\omega t)$;

$\overline{P} = \dfrac{1}{2}\dfrac{V_0^2}{R}$. Current density: $j = \dfrac{I}{A}$, $j = nev_d$, $j = E/\rho$. Charge of an electron $e = -1.6 \times 10^{-19}$ C.