Chapter 17 Electrical Energy and Current

ELECTRICAL POTENTIAL ENERGY *The displacement, d, is from the reference point and is parallel to the field. This equation is valid only for a uniform electric field.*	$PE_{electric} = -qEd$
POTENTIAL DIFFERENCE *The second half of this equation is valid only for a uniform electric field, and Δd is parallel to the field.*	$\Delta V = \frac{\Delta PE_{electric}}{q} = -E\Delta d$
POTENTIAL DIFFERENCE BETWEEN A POINT AT INFINITY AND A POINT NEAR A POINT CHARGE	$\Delta V = k_C \frac{q}{r}$
CAPACITANCE	$C = \frac{Q}{\Delta V}$
CAPACITANCE FOR A PARALLEL-PLATE CAPACITOR IN A VACUUM *The permittivity in a vacuum (ε_0) equals 8.85×10^{-12} $C^2/(N{\bullet}m^2)$.*	$C = \varepsilon_0 \frac{A}{d}$
ELECTRICAL POTENTIAL ENERGY STORED IN A CHARGED CAPACITOR *There is a limit to the maximum energy (or charge) that can be stored in a capacitor because electrical breakdown ultimately occurs between the plates of the capacitor for a sufficiently large potential difference.*	$PE_{electric} = \frac{1}{2}Q\Delta V = \frac{1}{2}C(\Delta V)^2 = \frac{Q^2}{2C}$
ELECTRIC CURRENT	$I = \frac{\Delta Q}{\Delta t}$
RESISTANCE	$R = \frac{\Delta V}{I}$
OHM'S LAW *Ohm's law is not universal, but it does apply to many materials over a wide range of applied potential differences.*	$\frac{\Delta V}{I} = \text{constant}$
ELECTRIC POWER	$P = I\Delta V = I^2R = \frac{(\Delta V)^2}{R}$