Unit 8

Saturday, March 20, 2021 9:06 PM

I. Chapter 16
   a. Static Electricity; Electric Charge and Its Conversion
      i. Unlike charges attract; like charges repel
      ii. Law of conversation of electric charge
         1) The net amount of electric charge produced in any process is zero
         2) No net electric charge can be created or destroyed
   b. Induced Charge; the Electroscope
      i. Charging by conduction: Where electrons get transferred and objects end up with the sign of charge
   c. Coulomb's Law: $F = k\frac{!_!!_"}{"^"}$
      i. $k = 8.98\times10^{\#}Nm^{\$}/C^{\$}$

II. Electric Currents
   a. Electric Current
      i. Circuit: When a continuous conducting path is connected between the terminals of a battery
      ii. Electric Current: A flow of charge
      iii. Ampere: Current, measured in coulombs per second
      iv. Complete Circuit: A circuit with a continuous conducting path
      v. Open Circuit: When no current flows
   b. Ohm's Law: Resistance and Resistors
      i. Ohm's Law: $V = IR$
      ii. Graphs
         1) $f(V) = I;\ \frac{\Delta I}{\Delta V} = \frac{1}{R}$
      iii. Voltage Drop/Potential Drop: An electric potential decrease
      iv. Resistivity of wires: $R = \frac{\%\&}{'}$
   c. Electric Power:
      i. Power: $P = IV$
      ii. Watt: $1W = 1\frac{(}{)}$

III. DC Circuits
   a. EMF and Terminal Voltage
      i. Electromotive force: Coverts other forms of energy to electric
      ii. Internal Resistance: The resistance in the power source
      iii. Terminal Voltage: $V_{*_+} = V_* - V_+$
   b. Resistance in Series and in Parallel
      i. Series Circuits
         1) Properties
            a) $I_{,} = I_{-} = I_{.}$
            b) $R_{,} = R_{-} + R_{.}$
            c) $V = V_{-} + V_{.}$
            d) Ohm's Law Applied: $V_{,} = I_{,}\ R_{,} = I_{,}\ (R_{-} + R_{.})$
         2) Changes to circuit

Net Change	**Voltage**	**Resistance**	**Current**
Voltage Increase	Increase	Constant	Increase
Voltage Decrease	Decrease	Constant	Decrease
Resistor Added	Constant	Increase	Decrease
Resistor Removed	Constant	Decrease	Increase
Current Increase	Increase	Constant	Increase
Current Decrease	Decrease	Constant	Decrease

      ii. Parallel
         1) Properties
            a) $I_{,} = I_{-} + I_{.}$
            b) $V_{,} = V_{-} + V_{.}$
            c) $\frac{1}{R_{,}} = \frac{1}{R_{-}} + \frac{1}{R_{.}};\ R_{,} = \frac{R_{-}\times R_{.}}{R_{-} + R_{.}}$
         2) Changes to circuit

Net Change	**Voltage**	**Resistance**	**Current**
Voltage Increase	Increase	Constant	Increase
Voltage Decrease	Decrease	Constant	Decrease
Resistor Added	Constant	Decreases	Increase
Resistor Removed	Constant	Increase	Decrease
Current Increase	Increase	Constant	Increase
Current Decrease	Decrease	Constant	Decrease

      iii. Common Examples: Series + Parallel as Bulbs
         1) Description: R_{-} seried to $R_{\$}$, $R_{/}$, and R_0 as parallel
         2) Changes

	R_{-}	$R_{\$}$	$R_{/}$	R_0
No Change	Brightest	Lowest	Lowest	Lowest
R_{-} Increase	Dimmer	Dimmer	Dimmer	Dimmer
$R_{\$10}$ Increase	Dimmer	Increase	Increase	Increase
$R_{\$10}$ Decrease	Increase	Dimmer	Dimmer	Dimmer

   c. Kirchhoff's Rules
      i. Junction (1st) Rule: At any junction point, the sum of all currents entering the junction must equal the sum of all currents leaving the junction
      ii. Loop (2nd) Rule: The sum of the changes in potential around any closed path of a circuit must be zero
      iii. Solving common problems for direction and magnitude:
         1) Using the junction rule, we can determine that at a specific junction, the sum of inputs must equal the output. Example: $I_{-} + I_{\$} = I_{/}$
         2) Using the loop rule (positive to negative), generate equations with $V - I_{.}\ R_{-} = 0$, current with the opposite directions are negative (ie add instead of subtract)
         3) Solve as a system of equations, if a current is negative, reverse the direction
   d. Brightness
      i. Brightness is determined by power

$$P = IV = I^{\$}R = \frac{V^{\$}}{R}$$