PHYS 2212

Look over Chapter 26 sections 1-7 Examples 3, 7

PHYS 1112

Look over Chapter 18 sections 1-5, 8 over examples 1, 2, 5, 8, 9,

GOOD THINGS TO KNOW

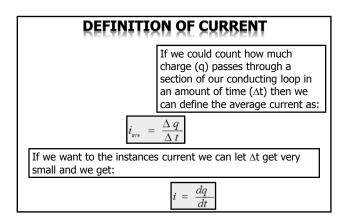
1) How to find a current in a wire.

- 2)What the Current Density and Draft Speed are.
- 3) What Resistance is.
- 4)How to use Ohm's Law
- 5) How to find the Power used in a circuit.

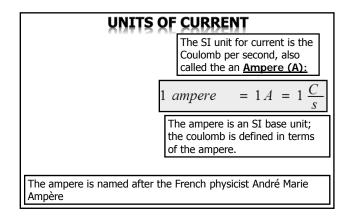
MOVING CHARG	ES
	So far we have been dealing with electrostatics (charges that are not moving). Now we want to focus on <u>Electric</u> <u>Currents</u> , charges in motion.
There are electric currents flowing all around us like the currents in household wiring or the tiny nerve currents that regulate muscular activity.	

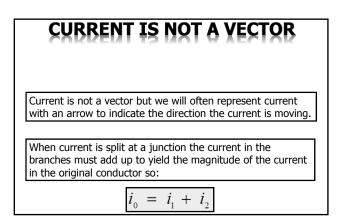
ELECTRIC CURRENT

If we insert a battery into a conducting loop then the loop is no longer at a single potential. Electric fields then act inside the material exerting forces on the conduction electrons, causing them to move, and thus establishing a current.









DIRECTION OF CURRENT

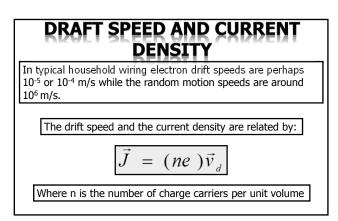
The charge carriers in conductors are electrons. The electric field forces them to move from the negative terminal to the positive terminal of the battery. For historical reasons we use the following convention:

A current arrow is drawn in a direction in which positive charge carriers would move, even if the actual charge carriers are negative and moving in the opposite direction.

CUBBENT DENSITY			
The current density <i>J</i> is a vector quantity that as the same direction as the electric field through a surface and has a magnitude <i>J</i> equal to the <u>current per unit area</u> through an element of that surface.			
$\vec{J} = \frac{i}{A}$ in the direction of \vec{E}			

DRIFT SPEED

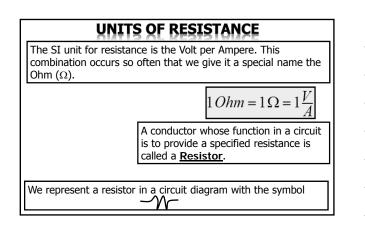
When a conductor does not have a current through it, its conducting electrons move randomly, with no net motion in any direction. When the conductor does have a current through it, these electrons actually still move randomly but now they tend to drift with a **Drift Speed** v_d in the direction opposite that of the applied electric field that causes the current.



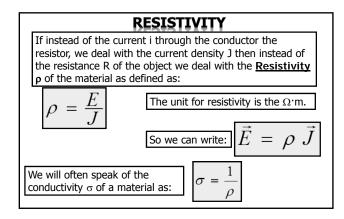
EXAMPLE 1

- 1) In the Bohr model of the hydrogen atom, an electron in the lowest energy state follows a circular path at a distance of 5.29×10^{-11} m from the proton.
- a) What is the speed of the electron?
- b) What is the effective current associated with this orbiting electron?

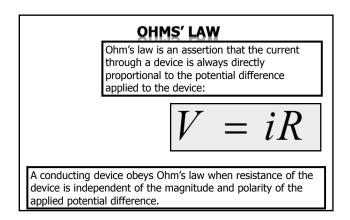
RESISTANCE REFINER	
	If we apply the same potential difference (V) between the ends of similar rods of two different metals, very different currents (i) will result.
If we where to graph the voltage (V) .vs. the current (i) we will get a straight line for most materials. The slope of this line is the resistance.	
V = Ri	or $R = \frac{V}{i}$

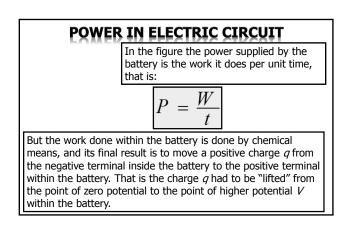




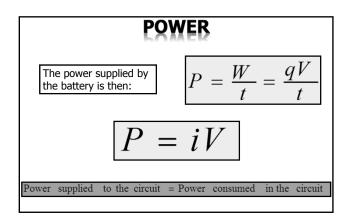




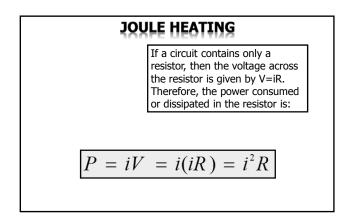












EXAMPLE 2

2) A high voltage transmission line carries 1000 A starting at 700 kV for a distance of 100 mi. If the resistance in the wire is 0.500 Ω /mi, what is the power loss due to resistive losses?