Lesson #4: Resistance

Resistance is a measure of how hard it is for an electric current to flow through a material. Resistance is measured in units of Ohms (Ω) with a ohmmeter.

***Orally**: For the purpose of this course, the loads in a circuit are responsible for the resistance of electron flow, but in reality a small amount of resistance does occur in the wire and internal resistance of electron flow occurs in batteries (or power supply).*

Resistors – any device that resists the flow of electrons in a circuit
e.g., heating elements, light bulb filaments, etc.

- the amount of resistance measured across a resistor depends on:

1. the material it's made of (e.g., carbon or metal wire with ceramic tubing)
2. the length (i.e., a longer resistor increases resistance)
3. the diameter (i.e., the smaller the diameter, the higher the resistance) See Fig. 1 pg.315

***Orally**: Look at the coloured bands on the side in Fig.1. Each colour indicates the resistance rating in Ohms. See the colour chart on Pg. 316.*

***Orally**: you are now an electron. Imagine running around the outside of a pool. Now imagine trying to run through the water in the pool. The medium that you run through (i.e., air vs. water) dictates the resistance that you experience (see point #1 above). Now if we were going to run out of the class, what would limit our ability to get out quickly?*
A: The door opening b/c it creates a bottle-neck effect (see point #3 in the list above)

The symbol used to represent a resistor in a circuit is:

Since resistors restrict the flow of electrons, we can change the resulting current (A) in a circuit by changing the resistance value (i.e., the greater the resistance, the lower the current). ***Orally**: A rheostat is a variable resistor which can be used to change the resistance and hence the current in a circuit. E.g., a dimmer switch.*

***Orally**:*
Q: How could we increase the current in a circuit without decreasing the resistance?
A: Push harder (i.e., increase the voltage).

Ohm's law is an equation used to show the relationship between voltage, current and resistance. The equation can be simply rearranged in order to solve for any of these values.

e.g., To solve for voltage:	To solve for current:	To solve for resistance:
$V = I R$	$I = V/R$	$R = V/I$

***Orally**: Since resistance increases with temperature, Ohm's law does not work perfectly in all situations. We will assume that Ohm's law works brilliantly for all circuits in this course.*

Exercises: Calculate the missing values in the following chart

Potential Difference (Volts)	Current (Amperes)	Resistance (Ohms)
3.0	? **(1.5A)**	2.0
3.0	? **(3.0A)**	1.0
3.0	? **(6.0A)**	0.5

$I = V/R$	$I = 3.0V/2.0\Omega$	$I = 1.5A$
	$I = 3.0V/1.0\Omega$	$I = 3.0A$
	$I = 3.0V/0.5\Omega$	$I = 6.0A$

***Orally**: Notice how the current increases with decreased resistance.*

Potential Difference (Volts)	Current (Amperes)	Resistance (Ohms)
3.0	? (1.5A)	2.0
4.0	? (2.0A)	2.0
5.0	? (2.5A)	2.0

***Orally**: Notice how the current can be increased with increased voltage.* Continue calc's

Assign C.Y.U 10.4 #1-8

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