Orientation, Oscilloscope, and Digital Multi-Meter

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**Objective**

To become familiarized with electrical circuit terminology and equipment that will be used throughout the semester, namely the Digital Multi-Meter (DMM) and the Oscilloscope. We will also be working with color coded resistors and the concepts of Voltage, Current, and Resistance.

**Theory**

The theories involved in this lab are those related to electrostatics and electrodynamics. Essential to electrostatics and –dynamics are the concepts of electrical charge and the movement of that charge, or the electrical current.

Charge is a property of subatomic particles, namely electrons and protons, and is measured in coulombs. Each of these elementary particles carries a charge of ± 1.6 E -19 C, with the charge on a proton being positive, and that of an electron negative.

In general, protons remain relatively stationary, but electrons can flow through a medium, and this would describe the phenomenon known as electrical current. Current is measured in Coulombs per second (C/s) or Amperes (A). Every material is resistant to this flow of electrons, and resistance is measured in ohms (Ω). In order to overcome this resistance and maintain a current, charge is driven through a circuit by ElectroMotive Force (emf), which is measured in volts (V). Volts are interchangeable with Joules per Coulomb (J/C).

When current flows through a circuit in one direction it is known as Direct Current (DC), and when the current moves through the circuit in alternating directions it is known as Alternating Current (AC).

These three are all related to one another through the equation:

[1]

[units: Volts = Amperes \* Ohms]

Digital Multi-Meters are tools used to measure these quantities by becoming a part of a circuit through a pair of test leads.

Oscilloscopes are used to measure the voltage of a system, and produce time based graphs, or traces of the voltage measured.

**Notes/Computations**

**Equations**

**Data**

**Conclusions & Questions**

1. An ideal ammeter would have zero resistance while an ideal voltmeter would have infinite resistance, why?

1. Is the true resistance greater or smaller than the measured resistance?
2. What is sweep time of a scan with a sweep rate of 60Hz?
3. Is the time base affected by changing the horizontal and vertical gains?
4. What is an ohm, what combination of fundamental SI units does it represent?
5. In step 19 of the oscilloscope procedure, you change the voltage per division to 2v/div. What happened to the trace and why?