Kevin Keating

Kkeating3@ivytech.edu

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**Experiment: Ohm’s Law**

**Introduction:**

Ohm’s Law states that the voltage (V) is directly proportional to the product of the current in a circuit (I) and the resistance (R) of that circuit:

**V = I • R**

The total power dissipated by a resistance is equivalent to the product of the current through that element and the voltage drop across that element, i.e.:

**P = I • V**

Voltage and amperage are directly proportional in a metallic conductor of constant temperature.

**Procedure:**

1. Load up the Java Lab from the web site: [**http://micro.magnet.fsu.edu/electromag/java/ohmslaw/index**](http://micro.magnet.fsu.edu/electromag/java/ohmslaw/index)**.**
2. Initially, set the voltage to 36.0 volts, set the resistance to 100 Ω, and record (in the table below) your measured values of current (mA) from the respective gauge.
3. Repeat the process by changing the resistances to any value you choose. Simply be sure to end with a resistance of 1 million ohms. Then calculate the power dissipated.
4. Explain what is happening to the colored lines on the resistor.
5. Return the voltage to 36.0 volt, and the resistance to 100 Ω.
6. Now keep the resistance set on 100 ohms, but select varying voltages from 36 V to 220 V. Fill in all columns in the data table.
7. Discuss **in detail** your results in terms of Ohm’s Law. Also include the importance of using the correct voltmeter and ammeter combinations when measuring voltage and current in a circuit. Discuss what could happen if good sound judgment and care is not used.

**Data and Observations:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Voltage, V**  **Volts** | **Current, I**  **mA** | **Resistance, R**  **Ω** | **Calculated Power**  **Watts** |
| **36.0** | **360.0** | **100** | **12.960** |
| **36.0** | **2.587** | **12598** | **0.093132** |
| **36.0** | **0.0479** | **75092** | **0.017244** |
| **36.0** | **0.319** | **112588** | **0.011484** |
| **36.0** | **0.143** | **250075** | **0.005148** |
| **36.0** | **0.079** | **450055** | **0.002844** |
| **36.0** | **0.062** | **575042** | **0.002232** |
| **36.0** | **0.036** | **1000000** | **0.001296** |

2.

4. The colors on the resistors are changing to represent the size of the resistor according to the resistor color code. Each band and color has significance and can be read to determine its size if one is familiar with the system or can be looked up on a chart if unfamiliar with the system.

6.

|  |  |  |  |
| --- | --- | --- | --- |
| **Voltage, V**  **Volts** | **Current, I**  **mA** | **Resistance, R, Ω** | **Calculated Power**  **Watts** |
| **36** | **360** | **100** | **12.960** |
| **63.6** | **636** | **100** | **40.450** |
| **82** | **820** | **100** | **67.240** |
| **109.6** | **1096** | **100** | **120.121** |
| **137.2** | **1372** | **100** | **188.238** |
| **157.9** | **1579** | **100** | **249.324** |
| **176.3** | **1763** | **100** | **310.817** |
| **192.4** | **1924** | **100** | **370.178** |
| **206.2** | **2062** | **100** | **425.184** |
| **210.8** | **2108** | **100** | **444.366** |
| **220** | **2200** | **100** | **484.0** |

**Conclusions:**

7. In accordance with Ohm’s law the measured amounts were the same as the expected results by calculation.

The ammeter should always be placed in series in the circuit. By contrast the voltmeter is place in parallel to the circuit.

It is also important to use meters that accurately sized to measure circuits. Using the appropriate scale of the meter is important as well. Using a meter that is too small for the circuits being measured can lead to imprecise measurements if a meter too large is used and would be dangerous if a meter too small is used. It is important to have an idea of what a circuit is capable of in both voltage and amperage before choosing a meter.