

# **LAB REPORT 2:**

**Resistances in Circuits**

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1. **SAME RESISTORS**

**Experimental data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Colors**  **1st  2nd 3rd 4th** | **Coded Resistance** | **Measured Resistance** | **% Error** | **Tolerance** |
| #1 | **Red – Red – Brown – Gold** | **220 Ω** | **217 Ω** | **1.36%** | **5%** |
| #2 | **Red – Red – Brown – Gold** | **220 Ω** | **219 Ω** | **0.45%** | **5%** |
| #3 | **Red – Red – Brown – Gold** | **220 Ω** | **217 Ω** | **1.36%** | **5%** |

|  |  |
| --- | --- |
| **Circuits** | **Resistances** |
| **Series**  a | R­12= 437  R­23= 436  R­123= 654  Req(calculated) = |
| **Parallel**  b | R­12= 72  R­23= 72  R­123= 72  Req(calculated) = |
| **Combination**  c | R­1= 217  R­23= 109  R­123= 326  Req(calculated) = |

**Questions:**

1. How is a multimeter inserted in a circuit in order to measure current, voltage and resistance?

Measuring Voltage: To measure voltage, the multimeter is connected in parallel with the component or portion of the circuit you’re interested in. The black lead is connected to the common terminal (COM) and the red lead is connected to the terminal marked V (for voltage).

Measuring Current: To measure current, the multimeter must be part of the circuit (connected in series). You need to break the circuit open at the point where you want to measure the current. Connect the black lead to the COM terminal and the red lead to the terminal marked A (for amperes).

Measuring Resistance: To measure resistance, the circuit must be powered off. The multimeter is connected across the component where you want to measure resistance. The black lead goes into the COM terminal and the red lead goes into the Ω terminal.

1. How does the % error compare to the coded tolerance for your resistors?

Comparing the percentage error to the coded tolerance, we can see that the percentage errors are all less than the tolerance of 5%. This means that all the resistors are within their specified tolerance range. In other words, the resistors are functioning as expected according to their color codes.

1. What is the apparent rule for combining **equal resistances** in series circuits? In parallel circuits? In combination circuits? Cite evidence from your data to support your conclusions.

The rule for combining equal resistances in series circuits is to add them together. **For example,** if you have two resistors with a resistance of 10 ohms each, when they are connected in series, the total resistance is 20 ohms

The apparent rule for combining equal resistances in a parallel circuit is that the equivalent resistance is equal to the original resistance divided by the number of resistors in parallel. For example, if you have two equal resistors in parallel, the equivalent resistance is half the value of one resistor. If you have three equal resistors in parallel, the equivalent resistance is one-third the value of one resistor, and so on.

1. **DIFFERENT RESISTORS**

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| --- | --- | --- | --- | --- | --- |
|  | **Colors**  **1st  2nd 3rd 4th** | **Coded Resistance** | **Measured Resistance** | **% Error** | **Tolerance** |
| #1 | **Brown – Red – Brown – Gold** | **120 Ω** | **120 Ω** | **0%** | **5%** |
| #2 | **Brown – Green – Brown – Gold** | **150 Ω** | **146 Ω** | **2.67%** | **5%** |
| #3 | **Brow – Black – Brown – Gold** | **100 Ω** | **98 Ω** | **2%** | **5%** |

|  |  |
| --- | --- |
| **Circuits** | **Resistances** |
| **Series**  a | R­12= 267  R­23= 245  R­123= 365  Req(calculated) = |
| **Parallel**  b | R­12= 40  R­23= 40  R­123= 40  Req(calculated) = |
| **Combination**  c | R­1= 120  R­23= 59  R­123= 179  Req(calculated) = |

1. What is the apparent rule for combining **unequal resistances** in series circuits? In parallel circuits? In combination circuits? Cite evidence from your data to support your conclusions.

The apparent rule for combining unequal resistances in series circuits is that the total resistance is equal to the sum of the individual resistances. In parallel circuits, the total resistance is less than the smallest individual resistance. In combination circuits, the total resistance can be calculated by identifying the individual series and parallel circuits and then solving them separately.

**Evidence for combining unequal resistances in series circuits:** This rule can be verified by measuring the voltage drop across each resistor in a series circuit and adding them up. The total voltage drop across the circuit should be equal to the voltage applied to the circuit.

**Evidence for combining unequal resistances in parallel circuits:** This rule can be verified by measuring the current through each resistor in a parallel circuit and adding them up. The total current through the circuit should be equal to the current supplied by the voltage source.

**Evidence for combining unequal resistances in combination circuits:** This rule can be verified by measuring the voltage and current across a combination circuit and then using Ohm's law to calculate the resistance. The calculated resistance should be equal to the total resistance of the combination circuit.

1. Is your measured value of Req similar to your calculated value? Explain

Occasionally, the meansured value just only approaching the Req value. The reason, is due to the difference between the environment in real life and laboratory. Further more, the meansured device plays a critical role in the process just as much as person factor. To sum up, meansured device, human and environment factors are what affected our meansured value.