

# **LAB REPORT 2:**

**Resistances in Circuits**

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**Members:**

1. Đỗ Nguyễn Lâm Hoàng – ITITIU21207 (leader) ......
2. Mai Nguyên Hoàng– ITITIU21208 (vice)...
3. Nguyễn Trịnh Nhật Minh – ITITIU21242 (vice)
4. Trần Phước Thuận – ITITIU21234 (vice) ...........
5. Nguyễn Hoàng Minh Phú – ITITIU21279 (vice)
6. **SAME RESISTORS**

**Experimental data:**

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|  | **Colors**  **1st  2nd 3rd 4th** | **Coded Resistance** | **Measured Resistance** | **% Error** | **Tolerance** |
| #1 | **Red Red Brown Gold** | **220 Ω** | **227 Ω** | **3.18%** | **5%** |
| #2 | **Red Red Brown Gold** | **220 Ω** | **218 Ω** | **0.9%** | **5%** |
| #3 | **Red Red Brown Gold** | **220 Ω** | **219 Ω** | **0.45%** | **5%** |

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| **Circuits** | **Resistances** |
| **Series**  a | R­12= 445 Ω  R­23= 436 Ω  R­123= 665 Ω  Req(calculated) =660 Ω |
| **Parallel**  b | R­12= 110 Ω  R­23= 111.5 Ω  R­123= 74.85 Ω  Req(calculated) = 73.33 Ω |
| **Combination**  c | R­1= 227 Ω  R­23= 111.5 Ω  R­123= 329 Ω  Req(calculated) =330 Ω |

**Questions:**

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

A multimeter must be inserted in series in a circuit to measure current. In contrast, it must be connected parallel in a circuit to measure voltage or resistance (place a probe tip at each end of the component being measured).

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

The % error between the coded and measured resistances is approximately 4.5 or 31.8 times less than the coded tolerance.

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 combined equal resistance of a series circuit is equal to the sum of individual resistances. (R123= 665 Ω; Req(calculated) = 660 Ω).
* The inverse of the equivalent resistance of a parallel circuit is equal to the sum of the inverse of each individual resistance. (R123= 74.85 Ω; Req(calculated) = 73.33Ω).
* The combined equal resistance of a combination circuit is equal to the sum of the series part of the circuit and the parallel part of the circuit. (R123 = 329Ω; Req(calculated) = 330Ω).

1. **DIFFERENT RESISTORS**

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|  | **Colors**  **1st  2nd 3rd 4th** | **Coded Resistance** | **Measured Resistance** | **% Error** | **Tolerance** |
| #1 | **Brown Black Yellow Gold** | **100 kΩ** | **98.4 kΩ** | **1.6%** | **5%** |
| #2 | **Blue Violet Orange Silver** | **67 kΩ** | **67.8 kΩ** | **1.2%** | **10%** |
| #3 | **Green Blue Orange Gold** | **56 kΩ** | **55.7 kΩ** | **0.536%** | **5%** |

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| **Circuits** | **Resistances** |
| **Series**  a | R­12= 166.3 kΩ  R­23= 123.5 kΩ  R­123= 221.9 kΩ  Req(calculated) =223 kΩ |
| **Parallel**  b | R­12= 40.1 kΩ  R­23= 30.58 kΩ  R­123= 23.33 kΩ  Req(calculated) =23.374 kΩ |
| **Combination**  c | R­1= 98.4 kΩ  R­23= 30.58 kΩ  R­123= 128.9 kΩ  Req(calculated) =130.5 kΩ |

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 combined resistance of a series circuit is equal to the sum of individual resistances. (R123= 221.9 kΩ; Req(calculated) = 223 kΩ).
* The inverse of the equivalent resistance of a parallel circuit is equal to the sum of the inverse of each individual resistance. (R123 = 23.33 kΩ; Req(calculated) = 23.37 kΩ).
* The combined resistance of a combination circuit is equal to the sum of the series part of the circuit and the parallel part of the circuit. (R123= 128.9kΩ; Req(calculated) = 130.5kΩ).

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

The measured value of R is almost similar to the calculated value with the % error differs from 0.1% to 1%, which can be explained by the tolerance of the resistors.