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| ***Instructions:***   * ***Submission must contain only original, individual, and current work.*** * ***After completion, save as PDF before submitting.*** |

## Task 1.10.1

### Objective:

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| DC voltage measurement using a DMM |

### Results/Calculations:

#### Step 1:

Table : Set Voltage vs. Measured Voltage

| Set Voltage (V) | Measured Voltage ( V ) | %Error |
| --- | --- | --- |
| +13 | 12.994 | .05% |
| -13 | -13.006 | .05% |

#### Step 2:

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| --- |
| When reading 26V we got 26V exactly, the percent error is 0%. |

Table :Voltage Reading at 26V

| Measured Voltage ( V ) | %Error |
| --- | --- |
| 26 | 0% |

#### Step 3:

Table : Type in an appropriate caption for the table below.

| Set Voltage (V) | Measured Voltage (V) | %Error |
| --- | --- | --- |
| 4.122 | 4.124 | .05% |
| 4.120 | 4.122 | .05% |

#### Step 4:

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| Since V = I\*R, then I = V / R. I = 7V / 330 Ohm = .0212 A. |

#### Step 5:

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| Since 7V with 330 Ohm resistance makes requires a current greater than the limit, the power supply will lower the voltage to account for the 330 Ohm load and meet the current limit. |
| The voltage of the power supply lowered from 7V to 5.26V which is just at the current limit of 15mA with 330 Ohm resistance. |

#### Step 6

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| V = 7V I = .015A R = V / I = 7 / .015 = 467 Ohm. The resistance required to get 7V at 15 mA is 467 Ohm. |

Table : Voltage measured with predicted resistance

| Measured Voltage ( V ) | %Error | Measured Current ( mA ) |
| --- | --- | --- |
| 7.002 | .03% | 15.16 |

### Conclusion:

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| The precision of the instruments is very good, they are within .05% error which is very good. |

## Task 1.10.2

### Objective:

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| Verification of Ohm’s Law |

### Circuit Schematic(s):

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|  |
| Figure : Test circuit for verifying Ohm’s Law.. |

### Results/Calculations:

#### Step 3

Table : Set Voltage vs. Measured Current

| Set Voltage ( V ) | Measured Current ( mA ) |
| --- | --- |
| 0 | 0 |
| .5 | .499 |
| 1 | 1.01 |
| 1.5 | 1.52 |
| 2 | 2.02 |
| 2.5 | 2.52 |
| 3 | 3.03 |
| 3.5 | 3.53 |

| Set Voltage ( V ) | Measured Current (mA ) |
| --- | --- |
| 4 | 4.03 |
| 4.5 | 4.53 |
| 5 | 5.04 |
|  |  |
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#### Step 4

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| I expect the relationship between I and V to be proportional. |

#### Step 5

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| Figure : Relationship between current and voltage. |
| The best fit relationship between I and V is V =.992I |

#### Step 6

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| Since the equation is for mA, multiply the slope by 1000 to get the proper resistance for Amps. R = .992 \* 1000 = 992 Ohms |

#### Step 7-8

Table : Type in an appropriate caption for the table below.

|  | Resistance ( Ohm ) | %Error (from labelled) |
| --- | --- | --- |
| Measured | 996.6 | .34% |
| Estimated | 992 | .8% |

#### Step 9

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| Tolerance band says the resistor has a tolerance of 1%. 1000 \* .01 = 10, 1000 + 10 =1010, 1000 – 10 = 990. The resistor has a range of 990 Ohms to 1010 Ohms. |

### Conclusion:

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| Voltage and current are directly proportional to each other, and resistance is the slope of their relationship. |

## Task 1.10.3

### Objective

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| DC current and voltage measurement of a bulb |

### Circuit Schematics

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| Figure : Test circuit for measuring different parameters for the light box. |

### Results/Calculations

#### Step 1:

Measure Resistance of bulb (Rbulb) = 8.56 Ohm

#### Step 2-3:

Table :Measured Current and Resistance and Calculated Power

|  |  |  |  |
| --- | --- | --- | --- |
| Set VS ( V ) | Measured Ibulb ( A ) | Measured Rphoto ( Ohm ) | Calculated Power ( W ) |
| 0 .1 | .01 | 9E12 MegaOhm | 0 |
| .5 | .019 | .99 MegaOhm | .0095 |
| 1 | .026 | .7 MegaOhm | .026 |
| 1.5 | .033 | .1 MegaOhm | .0415 |
| 2 | .038 | .03 MegaOhm | .076 |
| 2.5 | .043 | .0129 MegaOhm | .1075 |
| 3 | .048 | 680 kOhm | .144 |
| 3.5 | .052 | 412 kOhm | .182 |
| 4 | .056 | 274 kOhm | .224 |
| 4.5 | .06 | 196 kOhm | .27 |
| 5 | .063 | 147 kOhm | .315 |
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#### Step 4-5

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| Figure : Relationship between current and voltage in the bulb |
| No the light bulb cannot be accurately modeled as only a resistor since the relationship is not directly proportional. |

#### Step 6-7

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| Figure : (left) Relationship between current and resistance. (right) Relationship between resistance and power. |
| Inversely proportional |
| Inversely proportional |

### Conclusion:

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| With a resistor that changes its resistance, its I-V relationship is not directly proportional. |