Physics
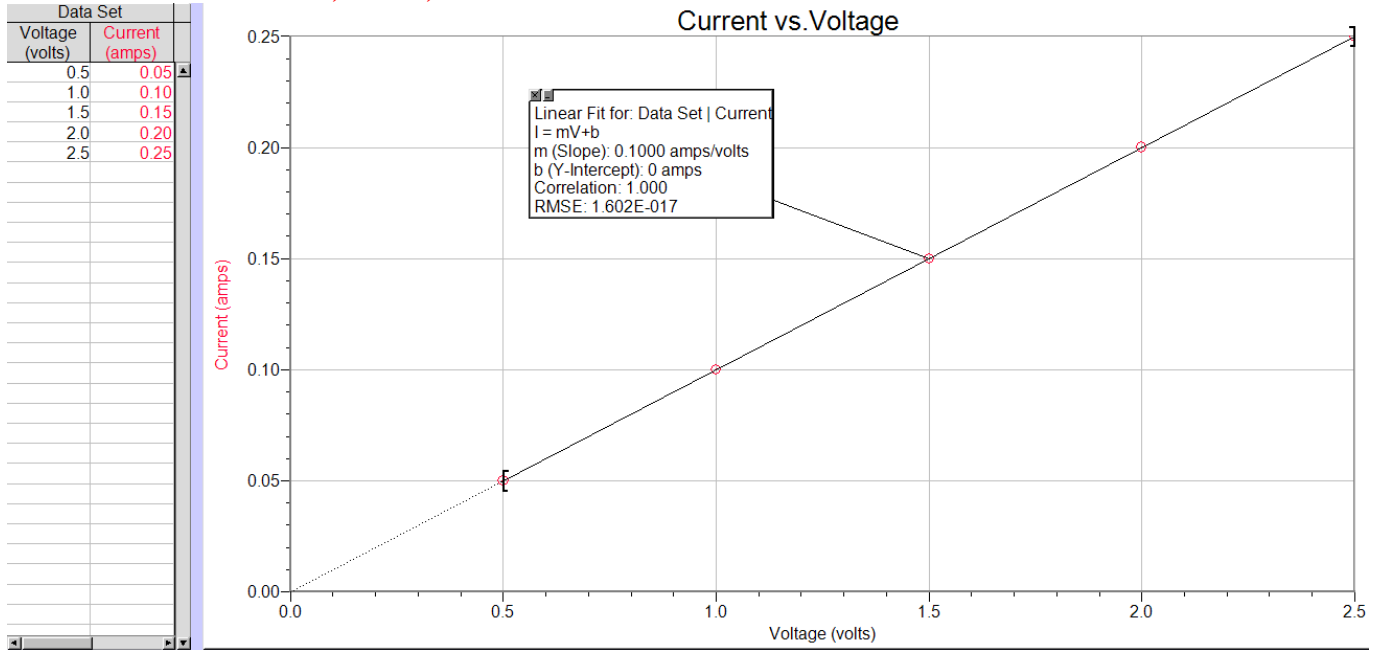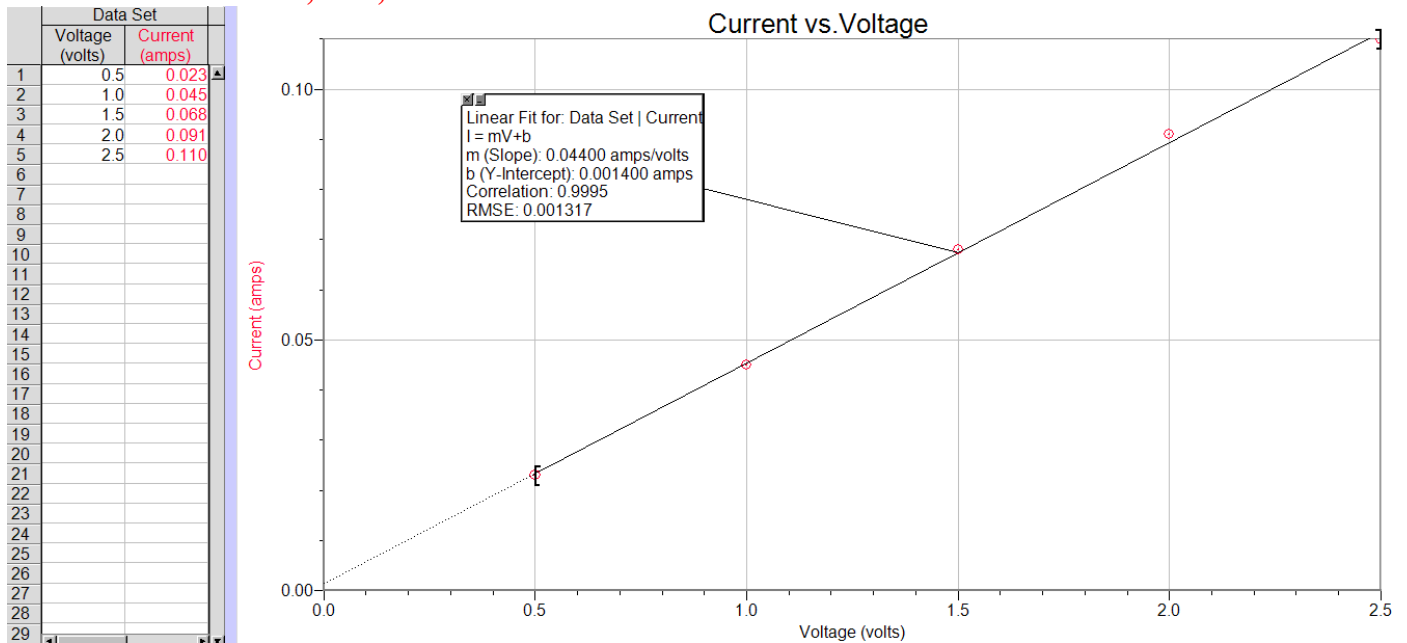**Simple Circuits & Unknown Resistors Makeup**

Name _____

Date _____

In this experiment, unknown resistors were placed into a circuit and data was collected for voltage and current. Through analysis of graphs and equations, the value of the resistance for each resistor could be determined. Look at the sample data below and answer the questions.
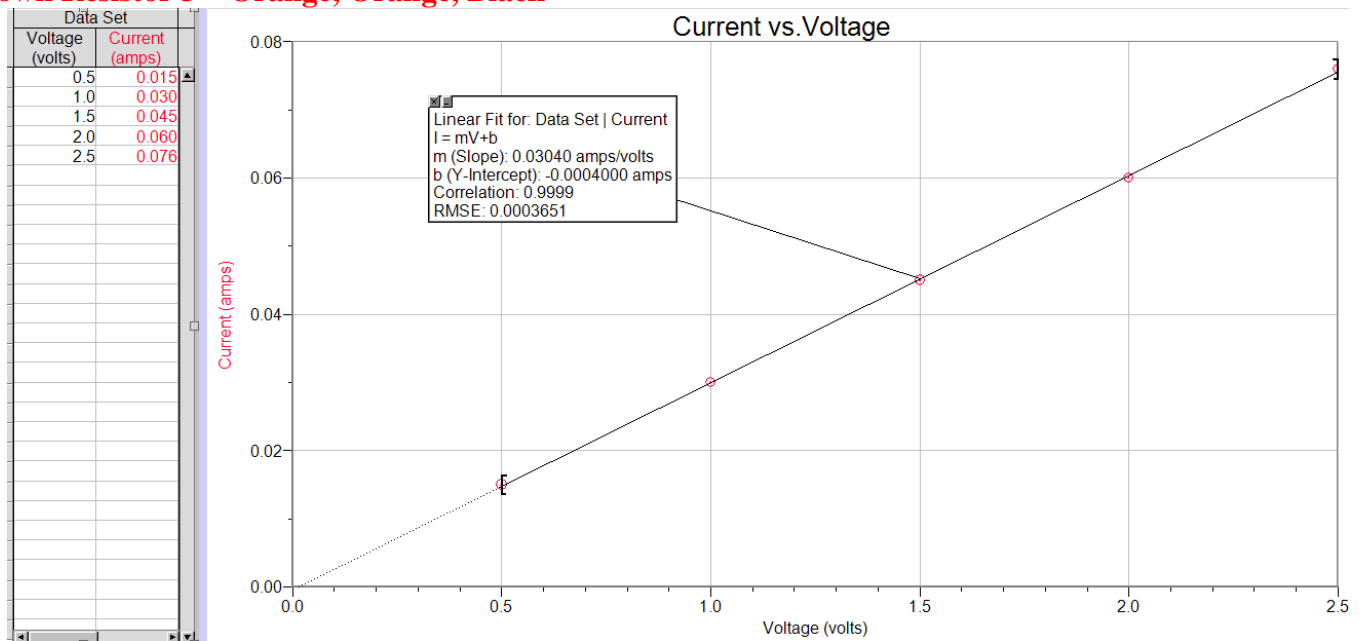
Unknown Resistor 1 – Brown, Black, Black

Voltage (volts)	Current (amps)
0.5	0.05
1.0	0.10
1.5	0.15
2.0	0.20
2.5	0.25

Current vs. Voltage

Linear Fit for: Data Set | Current
$I = mV + b$
m (Slope): 0.1000 amps/volts
b (Y-Intercept): 0 amps
Correlation: 1.000
RMSE: 1.602E-017

Unknown Resistor 2 – Red, Red, Black

	Voltage (volts)	Current (amps)
1	0.5	0.023
2	1.0	0.045
3	1.5	0.068
4	2.0	0.091
5	2.5	0.110
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Current vs. Voltage

Linear Fit for: Data Set | Current
$I = mV + b$
m (Slope): 0.04400 amps/volts
b (Y-Intercept): 0.001400 amps
Correlation: 0.9995
RMSE: 0.001317

Unknown Resistor 3 – Orange, Orange, Black

Data Set	
Voltage (volts)	Current (amps)
0.5	0.015
1.0	0.030
1.5	0.045
2.0	0.060
2.5	0.076

Current vs.Voltage

Linear Fit for: Data Set | Current
$I = mV+b$
m (Slope): 0.03040 amps/volts
b (Y-Intercept): -0.0004000 amps
Correlation: 0.9999
RMSE: 0.0003651

Current (amps)

Voltage (volts)

Post-lab Questions –

1. What is the relationship between the variables on each of the graphs?

2. What is the general equation for each of the graphs?

3. What are the translated equations for each of the graphs (list 3)?

4. Looking at the translated equations, how can you determine the value of the resistance for each resistor?

5. Provide the experimental values for the resistance of each resistor:
   a. Brown, Black Black

   b. Red, Red, Black

   c. Orange, Orange, Black

6. What would happen to the dependent variable if the independent variable were doubled?

7. Use your experimental values for resistance (answers to question 5) along with the equation below to calculate the percent error for each resistor. Please show your work.

$$\text{Percent Error} = \frac{\text{experimental value} - \text{actual (accepted) value}}{\text{actual (accepted) value}} \times 100\%$$

Actual Values
- Brown, Black, Black – 10 Ω
- Red, Red, Black – 22 Ω
- Orange, Orange, Black – 33 Ω

Additional Problems
8. Draw a circuit diagram to include a 60.0-V battery, an ammeter, and a resistance of 12.5 Ω in series. Indicate the ammeter reading (calculate the current) and the direction of the current.

9. Draw a series-circuit diagram showing a 4.5-V battery, a resistor, and an ammeter reading 0.090 A. Label the size of the resistor (calculate the resistance). Choose a direction for the conventional current and indicate the positive terminal of the battery.

10. There is a current of 3.00 A through a resistor when it is connected to a 12.0-V battery. What is the resistance of the resistor?

11. A small lamp is designed to draw a current of 3.00 x 10^2 mA in a 6.00-V circuit. What is the resistance of the lamp? (1000 mA = 1 A)

12. An electric toaster has a resistance of 12.0 Ω when hot. What will be the current though it when it is connected to 125 V?