PHYSICS 3204
Unit 2: Fields
Core Lab: Ohm's Law using a PhET Simulation

STUDENT NAME:_____

DATE:_____

GROUP MEMBERS:

_____ _____

PURPOSE:

- Determine the mathematical relationship between current, potential difference, and resistance in a simple circuit.
- Examine the potential vs. current behavior of a resistor and current vs. resistance for a fixed potential.

BACKGROUND:

The fundamental relationship among the three important electrical quantities current, voltage, and resistance was discovered by Georg Simon Ohm. The relationship and the unit of electrical resistance were both named for him to commemorate this contribution to physics. One statement of Ohm's law is that the current through a resistor is proportional to the voltage across the resistor and inversely proportional to the resistance. In this experiment you will see if Ohm's law is applicable by generating experimental data using a PhET Simulation:

http://phet.colorado.edu/en/simulation/ohms-law

Current and voltage can be difficult to understand, because they cannot be observed directly. To clarify these terms, some people make the comparison between electrical circuits and water flowing in pipes. Here is a chart of the three electrical units we will study in this experiment.

Electrical Quantity	Description	Unit	Water Analogy
Voltage or Potential Difference	A measure of the Energy difference per unit charge between two points in a circuit.	Volt (V)	Water Pressure
Current	A measure of the flow of charge in a circuit.	Ampere (A)	Amount of water flowing
Resistance	A measure of how difficult it is for current to flow in a circuit.	Ohm (Ω)	A measure of how difficult it is for water to flow through a pipe.

MATERIALS

- Computer
- PhET Simulation - Ohms Law

PRELIMINARY SETUP AND QUESTIONS:

1. With the Resistance slider set at its default value, move the potential slider, observing what happens to the current. If the voltage doubles, what happens to the current?

2. What type of relationship do you believe exists between voltage and current?

3. With the Voltage slider set at 4.5 V, move the resistance slider, observing what happens to the current. If the resistance doubles, what happens to the current?

4. What type of relationship do you believe exists between current and resistance?

PROCEDURE:

1. Set the Resistance slider to 300 ohms, Use the Voltage slider to adjust the Potential to the values in data table 1, also recording the resulting electric currents.

Table 1:

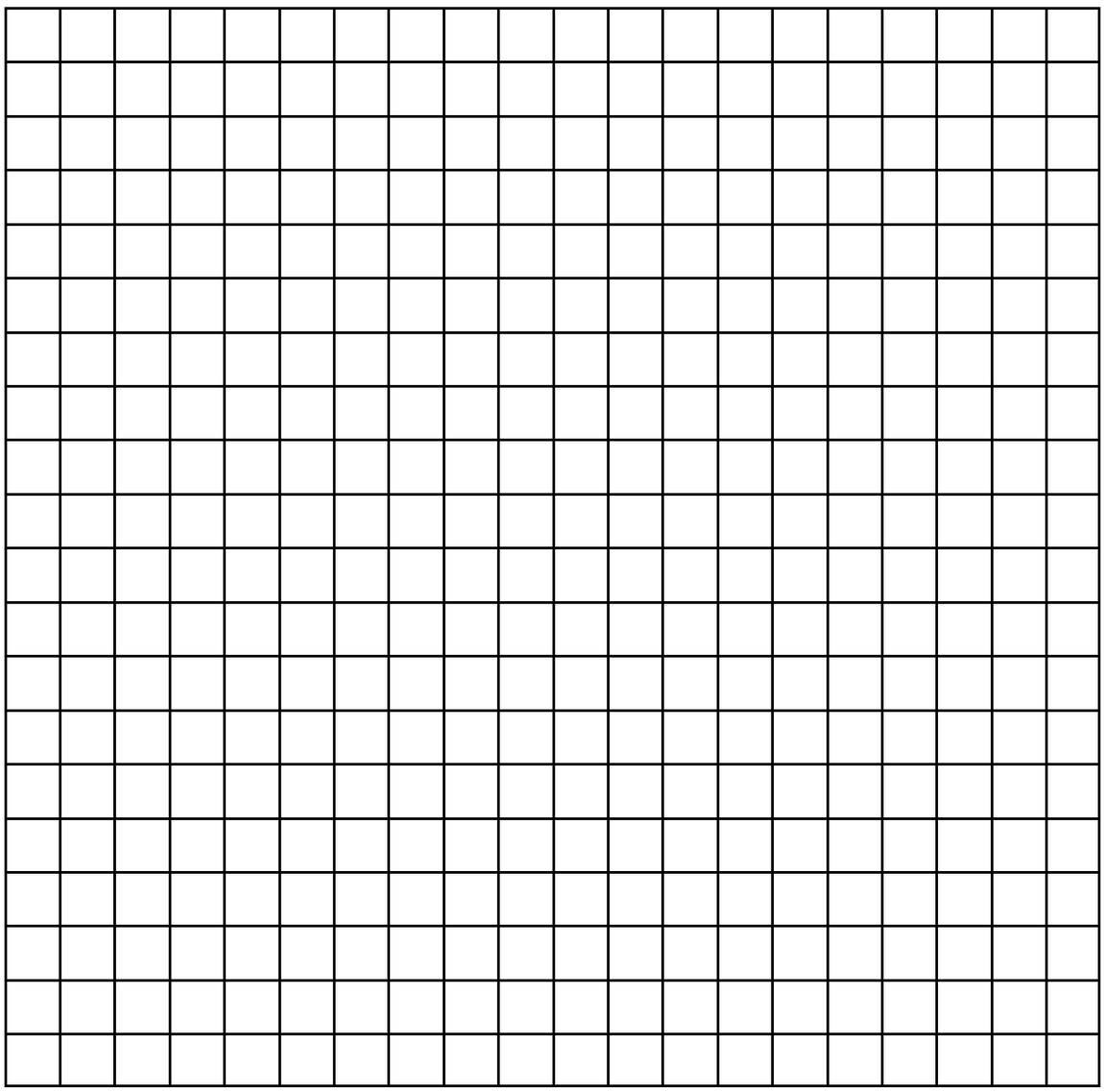
Current (mA)	Potential (V)
0	
1.5	
3.0	
4.5	
6.0	
7.5	
9.0	

2. Complete the same table for a new resistance . Your Resistance = _____

Table 2:

Current (mA)	Potential (V)
0	
1.5	
3.0	
4.5	
6.0	
7.5	
9.0	

3. Create a Voltage versus Current Graph for each set of data and draw a line of best fit. (Note: Put Current on the x axis and Voltage on the y- axis.



A) Calculate the slope of each graph:

Slope of Line 1 R = 300 Ohms	Slope of Line 2 R=_____ Ohms

B) What does the slope represent?

_____

_____

C) What would the steepness of the line represent?

_____

_____

D) Use the slope formula to write Ohm's Law?

4. Switch back to the PhET simulation. Return the Voltage Slider to 4.5 V. Now we will use the Resistance slider to set the Resistor to the values in the table. Fill in table 3 with your data:

Table 3:

Electric Potential ΔV = _____

Resistance (Ohms)	Current (mA)
0	
100	
200	
300	
400	
500	
600	
700	
800	
900	
1000	

Create a Current versus Resistance graph for each set of data and draw a line of best fit. (Note: Put Resistance on the x axis and Current on the y- axis)

A) Do the experimental data confirm that the electric current is inversely proportional to the Resistance for a fixed electric potential?

Conclusion: