Science 9 **Resistors and Ohm's Law** Name:

Introduction:
In this Lab, you will construct a circuit from a circuit diagram and measure the voltage and current using a voltmeter + ammeter. You will use that data to calculate resistance and construct a graph of voltage vs current for the circuit.

Question:

- As you increase the voltage(V) through a resistor, what happens to the current(I)?
- If you increase resistance(R) in the circuit below, what will happen to the voltage and current?

Hypothesis: (an educated answer to the Q above, using if/then/because)

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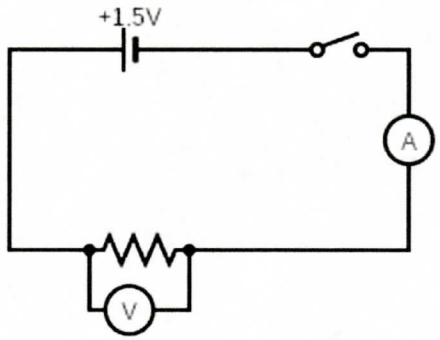
Safety:

- If any wires or resistors become hot, open the switch immediately.
- Make sure the positive terminal of the ammeter is connected to the positive end of the battery. The negative terminal of the ammeter should be connected to the negative end of the battery.
- Never connect an ammeter directly across terminals of the battery.
- There must load (in this case the resistor) in the circuit to slow down the flow of electrons.

Materials:
Resistors of different values
1 x ammeter
1 x voltmeter
Conducting wires
4 x D cells
1 x switch

Procedure

1. Construct the following circuit using your resistors and 1 cell. Be sure to leave the switch open until everything is connected. Close the switch briefly and record the voltage and current in the data table below. Be sure to convert your mA reading on the ammeter to Amps. (divide your mA value by 1000)



2. Replace your 1 cell with 2 cells (this makes a battery). Be sure to connect them (+) end to (-) end (series), and not side by side (parallel). When everything is connected repeat step #1
3. Correctly connect 3 cells together, repeat step #1.
4. Correctly connect 4 cells together, repeat step #1.
5. Remove the first resistor and replace it with your second resistor. Repeat steps #1-5.
6. Clean up the materials and put them back where you got them from.

Data Table #1: Calculated and Measured Resistance of 2 Resistors.

Resistor # 1

# of Cells	Voltage (V)	Current (mA)	Current (A)	$\frac{voltage}{current}$

Change in Voltage (RISE)	Change in Current (RUN)	Slope of the line ($\frac{rise}{run}$)

Resistor # 2

# of Cells	Voltage (V)	Current (mA)	Current (A)	$\frac{voltage}{current}$

Change in Voltage (RISE)	Change in Current (RUN)	Slope of the line ($\frac{rise}{run}$)

Data Table #2: Construct a graph comparing change in voltage (Y-axis) to change in current (X-axis). Graph BOTH sets of data on the same graph so we can visualize the resistance as the slope. Use a line of best fit for the graph.

Results:
Look at your data and observations. Interpret your data and describe the results of your experiment in one or two sentences.

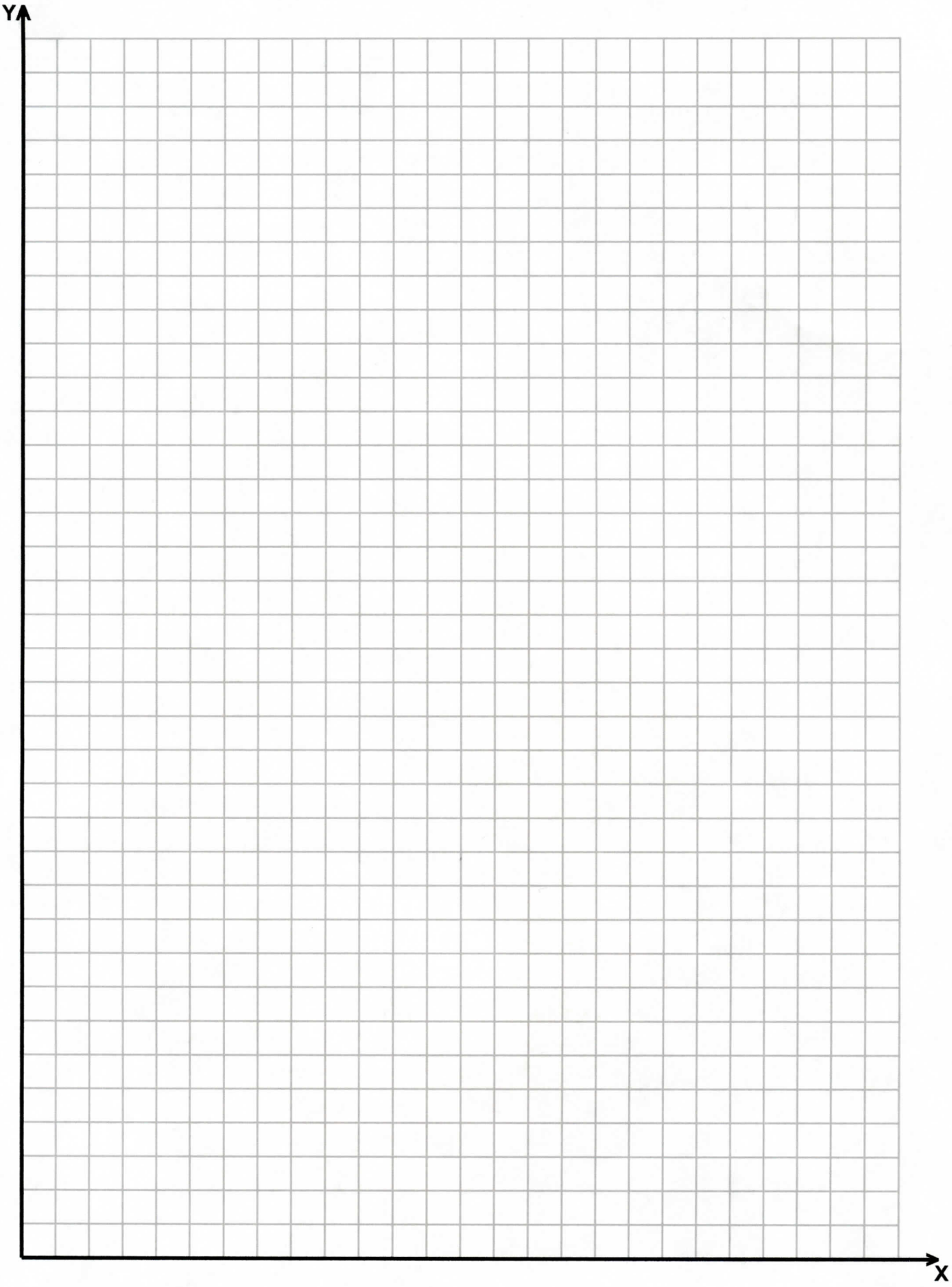
Conclusion:

a) **i.** Write a statement discussing if your hypothesis was supported or contradicted by your data and why. If your Hypothesis was not supported, rewrite a new one that is backed up by your data below.

ii. As you increase the voltage through a resistor, what happens to the current? (You can use Ohm's Law formula to validate your answer.)

iii. If you increase resistance in the circuit, what will happen to the voltage and the current? (You can use Ohm's Law formula to validate your answer.)

b) Discuss your method. Were there problems or errors in your lab procedure? Do you have suggestions for improving the lab? Do you have any further questions now that you have finished the lab?


Y
X

Data Table #1: Calculated and Measured Resistance of 2 Resistors.

Resistor # 1

# of Cells	Voltage (V)	Current (mA)	Current (A)	$\frac{voltage}{current}$
1	1.2 V	.13 → 13mA	.013 A	$\frac{1.2V}{.013A} = 92.3\Omega$
2	2.5 V	.26 → 26mA	.026 A	96.2Ω
3	3.7 V	.40 → 40mA	.040 A	92.5Ω
4	5.0 V	.51 → 51mA	.051 A	98.0Ω

100 scale ammeter

10 or 5 voltmeter for both

Change in Voltage (RISE)	Change in Current (RUN)	Slope of the line ($\frac{rise}{run}$)
0 → 5 V	0 → .051 A	$\frac{5}{.051} = 98.0\ \Omega$

Resistor # 2

# of Cells	Voltage (V)	Current (mA)	Current (A)	$\frac{voltage}{current}$
1	1.2 V	6.5 mA	.0065 A	$\frac{1.2V}{.0065A} = 184.6\Omega$
2	2.4 V	12.5 mA	.0125 A	192.0Ω
3	3.6 V	18.5 mA	.0185 A	195.0Ω
4	4.8 V	24 mA	.0240 A	200.0Ω

Change in Voltage (RISE)	Change in Current (RUN)	Slope of the line ($\frac{rise}{run}$)
4.8 V	.024 A	$\frac{4.8}{.024} = 200\Omega$

Data Table #2: Construct a graph comparing change in voltage (Y-axis) to change in current (X-axis). Graph BOTH sets of data on the same graph so we can visualize the resistance as the slope. Use a line of best fit for the graph.