

UNIT: ELECTRICAL CIRCUITS

ACT-BASED SCIENCE: OHM'S LAW INVESTIGATION (DATA ANALYSIS & GRAPHING)

These **hands-on science activities** align with **ACT Science College and Career Readiness Standards (CCRS)** and reinforce key skills like **data interpretation, experimental design, and scientific reasoning**—all while deepening students' understanding of **electric circuits**.

ACT SKILLS PRACTICED:

- ✓ Interpreting data tables & graphs
- ✓ Identifying patterns & relationships
- ✓ Applying scientific formulas

OBJECTIVE:

Students will collect and analyze data to determine the relationship between **voltage, current, and resistance** using Ohm's Law ($V=IR$).

MATERIALS:

- Batteries (9V)
- Resistors (various ohm values)
- Wires & alligator clips
- Multimeters (to measure voltage & current)
- Data table worksheet

STUDENT DIRECTIONS:

Goal: Determine the mathematical relationship between voltage, current, and resistance using Ohm's

STEP 1: Build a Simple Circuit

1. Gather your battery, one resistor (start with 10Ω), wires, and multimeter.
2. Connect the resistor in series with the battery using alligator clips.
3. Attach the multimeter **in series** to measure **current (I)** in **amperes (A)**.

- Switch the multimeter mode to **voltage (V)** and connect it **in parallel** with the resistor to measure voltage across it.
- Double-check your connections with your teacher before turning on the circuit.

STEP 2: Collect and Record Data

- Once your circuit is complete and safe, measure:
 - The voltage across the resistor (should be ~9V).
 - The current flowing through the circuit.
- Record the data in the table below.
- Repeat steps using **different resistor values** (50Ω and 100Ω).

Resistor (Ω)	Voltage (V)	Current (A)	Calculated Resistance (Ω)
10	9		
50	9		
100	9		

Hint: Use the Ohm's Law equation to calculate resistance if needed: $R = V / I$

STEP 3: Graph Your Data

- On graph paper or using a digital tool:
 - X-axis** = Current (I)
 - Y-axis** = Voltage (V)
- Plot all three data points from your table.
- Draw a best-fit line.
- Label your axes and add a title: "Voltage vs. Current in a Simple Circuit"

STEP 4: Analyze Your Results

Answer these questions in complete sentences:

- What pattern do you notice between voltage and current in your graph?

→ _____

→ _____

- What happens to current when resistance increases?

→ _____

→ _____

- Does your data follow Ohm's Law? Why or why not?

→ _____

- _____
4. What could explain any errors or differences in your measurements?
- _____
- _____

ACT-STYLE DATA TABLE:

Resistor (Ω)	Voltage (V)	Current (A)	Calculated Resistance (Ω)
10 Ω	9V	0.9A	?
50 Ω	9V	0.18A	?
100 Ω	9V	0.09A	?

DISCUSSION QUESTIONS:

- Based on your graph, what relationship do you observe between voltage and current?
- How does increasing resistance affect current flow?
- Does your data support Ohm's Law? Why or why not?

ACT-STYLE MULTIPLE CHOICE QUESTION:

- Which of the following best describes the relationship between **voltage and current** in a circuit with a fixed resistance?
 - A. Exponential
 - B. Quadratic
 - C. Linear
 - D. Random

☀️ Why These ACT-Based Science Activities Matter

- ✓ Prepares students for ACT Science by reinforcing **data analysis, graph interpretation, and experimental design.**
- ✓ Develops **STEM inquiry skills**—helping students **think like scientists and engineers.**
- ✓ Connects **electrical circuits to real-world applications**, from home wiring to **renewable energy technologies.**