OHM'S LAW

OBJECTIVE

To verify Ohm's Law $V = IR$.

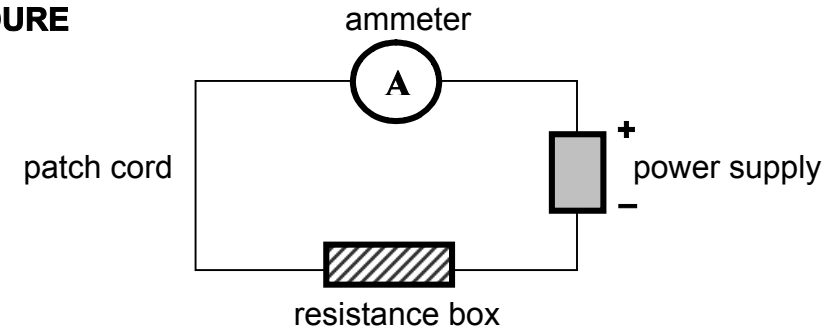
EQUIPMENT

Hewlett Packard power supply, decade resistance box, analog ammeter, Fluke digital multimeter, patch cords, alligator clips

THEORY

The resistance R of any resistor is, by definition, constant. According to Ohm's Law, $R = V/I$, where V is the voltage difference across the resistor and I is the resulting current.

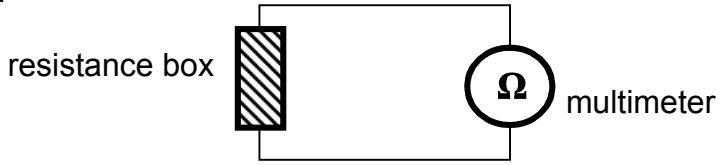
PROCEDURE



Be sure that your power supply is switched off and then set up the circuit as shown above. Ask your lab instructor to inspect your circuit before proceeding to the next step.

Circuit I

1) Dial up 20 ohms on your resistance box. Turn the power supply's *coarse* and *fine* adjustments knobs completely to the left (zero position) then switch on the power supply.
2) Set your multimeter to read dc voltage by turning the dial to the symbol $\overline{V}$. Connect the multimeter in parallel with the resistance box using two patch cords (*not shown in the diagram*).
3) Slowly turn the *coarse* knob until the ammeter reads 0.10 A. Record the voltage measured on the multimeter in the data table.
4) Repeat Step 4 for ammeter readings 0.15 A, 0.20 A, 0.25 A, 0.30 A, 0.35 A, 0.40 A, 0.45 A, 0.50 A, and 0.55 A.
5) Turn the *coarse* knob completely to the left and switch off the power supply.
6) Set your multimeter to read resistance by turning the dial to the symbol Ω. Disconnect the resistance box from the circuit but leave the multimeter in parallel:

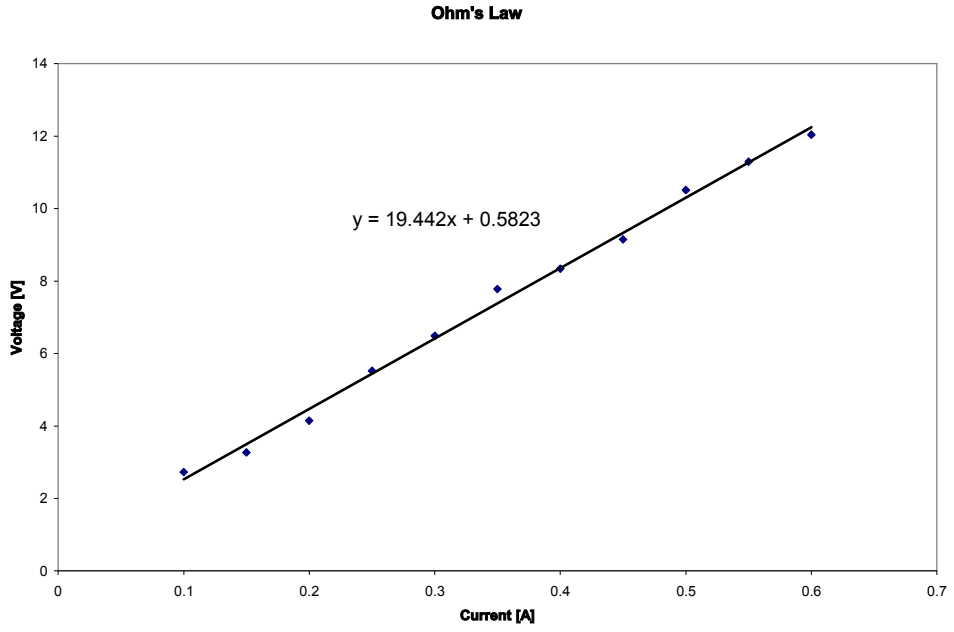


7) Record the resistance reading as the *accepted resistance*.
8) Use Excel to plot your data (see below). Set *current* as your x value and *voltage* as your y value. Fit to a linear trendline and display its equation on your graph. Record the slope as the *experimental resistance*.
9) Compute the percent discrepancy as

$$\%\ discrepancy = \frac{|Accepted - Experimental|}{Accepted} \times 100$$

Circuit II

10) Dial up 50 ohms on your resistance box and rebuild your circuit. Switch on the power supply.
11) Set your multimeter once again to read $\overline{V}$ and connect it in parallel with the resistance box.
12) Slowly turn the *coarse* knob until the ammeter reads 0.02 A. Record the voltage measured on the multimeter in the data table.
13) Repeat Step 12 for ammeter readings 0.04 A, 0.06 A, 0.08 A, 0.10 A, 0.12 A, 0.14 A, 0.16 A, 0.18 A and 0.20 A.
14) Turn the *coarse* knob completely to the left and switch off the power supply.
15) Set your multimeter to read Ω. Disconnect the resistance box from the circuit but leave the multimeter in parallel.
16) Record the resistance reading as the *accepted resistance*.
17) Use Excel to plot your data and fit it to a linear trendline (see below). Record the slope as the *experimental resistance*.
18) Compute the percent discrepancy.



ASSIGNMENT: due by the end of the lab period
Each group is required to submit two Excel graphs stapled to a completed data sheet.

Name _____ **Date** _____

Partners _____

_____

OHM'S LAW DATA SHEET

Circuit I

I [amperes]	*V* [volts]
0.10	
0.15	
0.20	
0.25	
0.30	
0.35	
0.40	
0.45	
0.50	
0.55	

Accepted Resistance = _____ Ω

Experimental Resistance = _____ Ω

% Discrepancy = _____ %

Circuit II

I [amperes]	*V* [volts]
0.02	
0.04	
0.06	
0.08	
0.10	
0.12	
0.14	
0.16	
0.18	
0.20	

Accepted Resistance = _____ Ω

Experimental Resistance = _____ Ω

% Discrepancy = _____ %

QUESTIONS

1) Why must an ammeter be attached in series in order to measure current? Explain your answer.

2) Why must a voltmeter be attached in parallel in order to measure voltage? Explain your answer.

3) Suppose that your multimeter measured a *negative* rather than a *positive* voltage across your resistance box. Is there a malfunction with your meter? (Yes/No) Explain why this happened and how you could fix the problem.