

Experiment 7: Kirchhoff's Rules

EQUIPMENT NEEDED:

- Circuits Experiment Board
- Wire Leads
- Resistors.
- Two D-cell Batteries
- Digital Multimeter (DMM)

Purpose

The purpose of this lab will be to experimentally demonstrate Kirchhoff's Rules for electrical circuits.

Procedure

- ① Connect the circuit shown in Figure 7.1a using any of the resistors you have except the $10\ \Omega$ one. Use Figure 7.1b as a reference along with 7.1a as you record your data. Record the resistance values in the table below. With no current flowing (the battery disconnected), measure the total resistance of the circuit between points **A** and **B**.

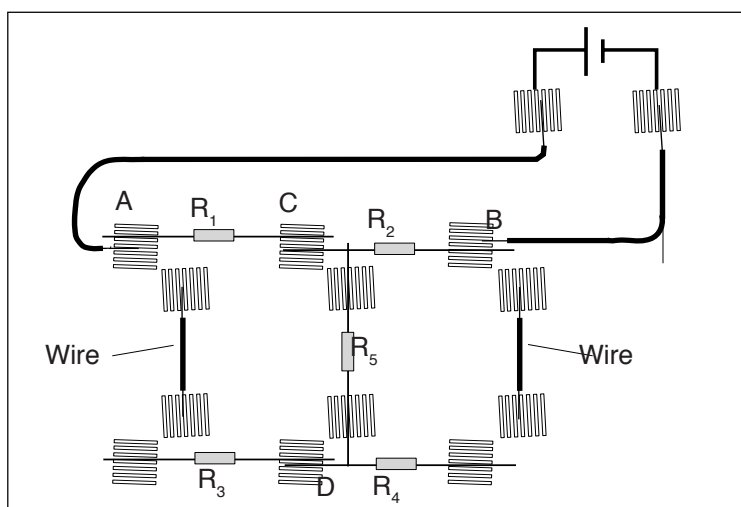


Figure 7.1a

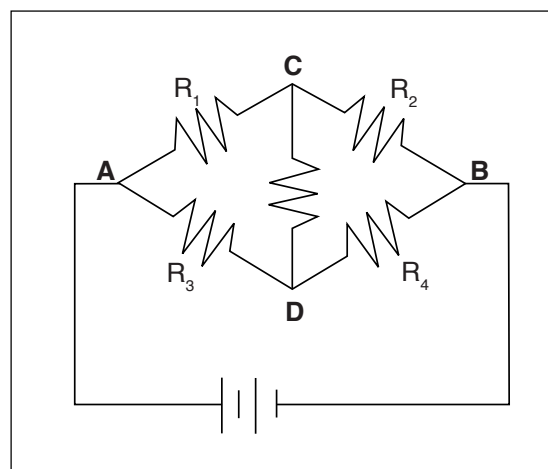


Figure 7.1b

- ② With the circuit connected to the battery and the current flowing, measure the voltage across each of the resistors and record the values in the table below. On the circuit diagram in Figure 7.1b, indicate which side of each of the resistors is positive relative to the other end by placing a "+" at that end.
- ③ Now measure the current through each of the resistors. Interrupt the circuit and place the DMM in series to obtain your reading. Make sure you record each of the individual currents, as well as the current flow into or out of the main part of the circuit, I_T .

Resistance, Ω	Voltage, volts	Current, mA
R_1	V_1	I_1
R_2	V_2	I_2
R_3	V_3	I_3
R_4	V_4	I_4
R_5	V_5	I_5
R_T	V_T	I_T

Table 7.1

Analysis

- ① Determine the net current flow into or out of each of the four “nodes” in the circuit.
- ② Determine the net voltage drop around at least three (3) of the six or so closed loops. Remember, if the potential goes up, treat the voltage drop as positive (+), while if the potential goes down, treat it as negative (-).

Discussion

Use your experimental results to analyze the circuit you built in terms of Kirchhoff’s Rules. Be specific and *state the evidence* for your conclusions.

Extension

Build the circuit below and apply the same procedure you used previously. Analyze it in terms of Kirchhoff’s Rules. If possible, try to analyze the circuit ahead of time and compare your measured values with the theoretically computed values.

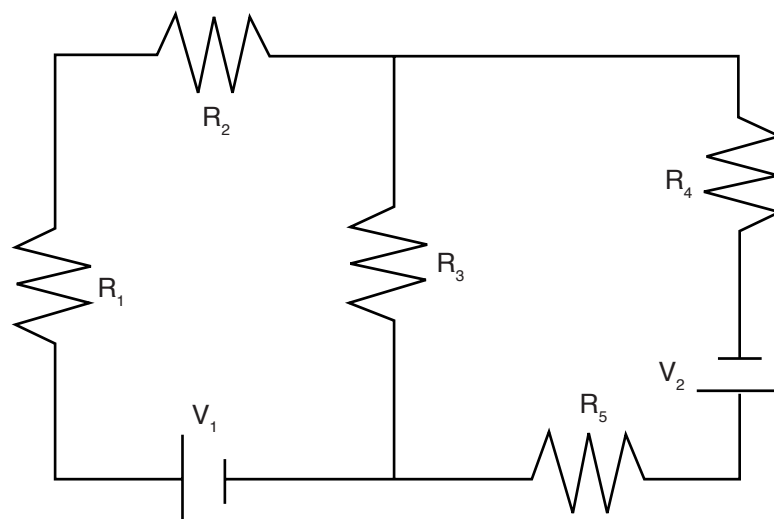


Figure 7.2