
LAB 3. MEASURING VOLTAGE

Problem

- How do we measure voltage?

Equipment

Voltmeter, leads, voltage source, resistors, breadboards, poorly conducting paper, battery

Background

Measuring voltage is a critical part of building and analyzing circuits. It is easy to do, as long as you keep a few things in mind.

- Voltage is the electric potential difference between different locations. It is not a property of a particular location, but of two different locations.
- Voltage has polarity, or sign. Voltage measured between two points in one direction is the opposite (negative) of voltage measured in the other direction. Some voltmeters can measure both positive and negative voltage, while others can measure only positive voltage.
- The voltage between any two points on the same conductor is zero.
- Turn off the voltmeter when you are not using it.
- Use the sensitivity setting that gives the largest needle deflection (using an analog meter) or the greatest number of significant digits (if using a digital meter) without exceeding the dynamic range (“pinning” the meter).

Activities

There are four activities. You may complete them in any order. Your instructor must verify that you completed each activity to receive credit for the lab.

Battery voltage

Use the voltmeter of your choice to measure the voltage between the terminals of a battery.

Poorly conducting paper

The terminals of a voltage source are connected to the ends of the poorly conducting paper. Connect the negative lead of your voltmeter to the negative terminal of the source. Press the positive lead of the voltmeter onto the paper at different places. Find the overall pattern of voltage at different places.

Series resistors

The circuit consists of resistors and wires on a “breadboard,” in which the all the perforations in a single row on one or the other side of the lengthwise slit are electrically connected to each other. The breadboard makes it easy to assemble a temporary circuit.

In this circuit, the resistors are connected one after the other between the positive and negative terminals of a voltage source. Measure the voltage across each resistor, and across sets of resistors (the positive end of one resistor to the negative end of another). Is there a relationship between the voltage across a series of resistor and the voltages across the individual resistors in the series?

Parallel resistors

This is another circuit on a breadboard. In this circuit, however, several resistors are connected in *parallel*: they are connected between the same two rows of the breadboard. Measure the voltages across the resistors. Is there a relationship between the voltages across the resistors connected in this way?

Lab Report

Are you kidding?