

ECE 109L - THE VERY BASICS - LAB 2 MEASURING VOLTAGE

FALL 2006

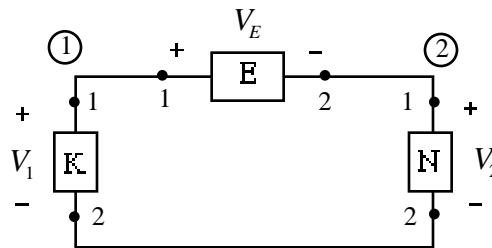
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OBJECTIVE

The objective of this lab is to learn how to measure voltages in resistor circuits and to see how the choice of a voltage's reference direction affects its sign.

LAB

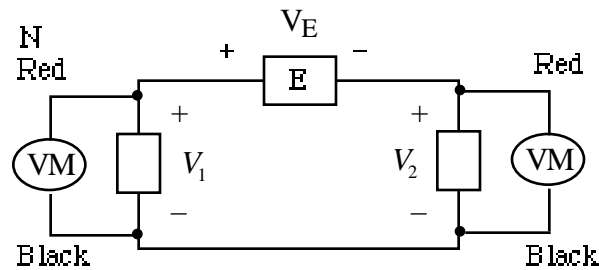
- From ECE 109 Lecture we know that the voltage across a resistor is a measure of how "hard" the electrons are being pushed through it. And we know that the voltage drop across a circuit element like E in the following circuit



is the voltage at the plus terminal minus the voltage at the negative terminal as follows

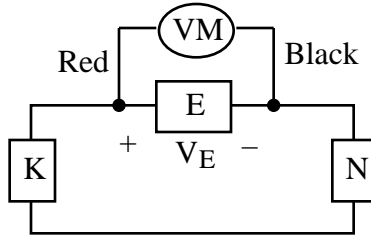
$$V_E = V_1 - V_2$$

To measure V_1 and V_2 we connect a voltmeter VM across K and N as follows



with the voltmeter set to the scale DCV.

- PreLab** - Draw the circuit with the voltmeters connected to measure V_1 and V_2 . Be sure to indicate the colors of the leads and the numbers 1 and 2 showing how the circuit is connected
 - Measure the voltages V_1 and V_2
 - Make use of your result in part (b) to calculate V_E
- In Problem (1) we obtained V_E by measuring and then subtracting V_1 from V_2 . Alternatively we can measure V_E directly by connecting the voltmeter **across** E as follows



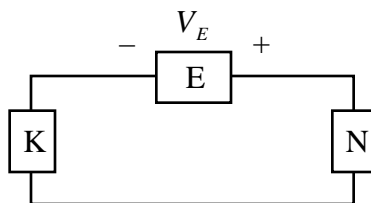
- PreLab** - Draw the circuit above for measuring V_E . Be sure to indicate the colors of the leads.
- PreLab** - Describe in words where to connect the red and black leads when measuring voltage drops.
- Measure V_E
- Compare your values for V_E measured directly in part (c) and calculated in Problem (1). In particular put your results in a Table with a column for your calculated value of V_E , a column for your measured value of V_E and a column for the percentage difference between them as follows

Variable	Calculated	Measured	% Difference
V_E			

And then state whether the calculated and measured values are reasonably close.

Be sure to always use a Table like this together with a conclusion whenever you're asked to compare results.

- Let us again measure the voltage across E in our circuit - but this time with the reference direction reversed as follows



- PreLab** - Draw the circuit with the voltmeter inserted to measure V_E . Be sure to indicate the colors of the leads.
- Calculate V_E from V_1 and V_2
- Measure V_E
- Compare your calculated and measured values of V_E
- Write an equation for V_E as a function of V_E
- Describe in words how V_E is related to V_E and why