Experiment 5: Voltages in Circuits

EQUIPMENT NEEDED:

– AC/DC Electronics Lab Board: Wire Leads, Resistors
– D-cell Battery
– Multimeter

Purpose

The purpose of this lab will be to continue experimenting with the variables that contribute to the operation of an electrical circuit. You should have completed Experiment 4 before working on this lab.

Procedure

① Connect the three equal resistors that you used in Experiment 4 into the series circuit shown below, using the springs to hold the leads of the resistors together without bending them. Connect two wires to the D-cell, carefully noting which wire is connected to the negative and which is connected to the positive.

② Now use the voltage function on the Multimeter to measure the voltages across the individual resistors and then across the combinations of resistors. Be careful to observe the polarity of the leads (red is +, black is -). Record your readings below.

Series

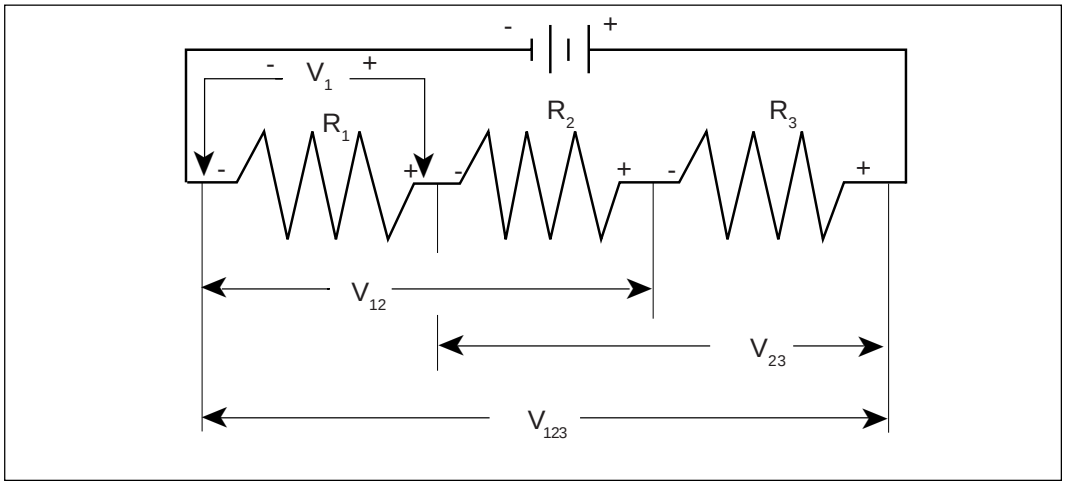


Figure 5.1

R_1 = _____ V_1 = _____

R_2 = _____ V_2 = _____

R_3 = _____ V_3 = _____

R_{12} = _____ V_{12} = _____

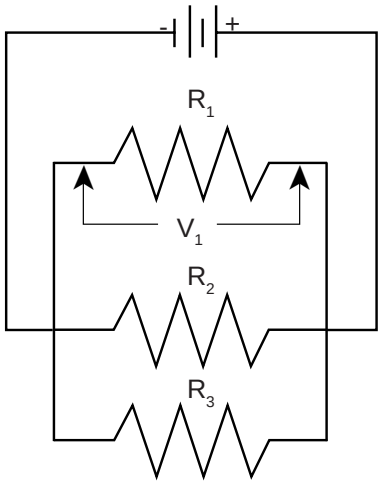
R_{23} = _____ V_{23} = _____

R_{123}= _____ V_{123}= _____

③ Now connect the parallel circuit below, *using all three resistors*. Measure the voltage across each of the resistors and the combination, taking care with the polarity as before.

➤ **NOTE:** Keep all three resistors connected throughout the time you are making your measurements. Write down your values as indicated below.

Parallel



R_1 = _____ V_1 = _____

R_2 = _____ V_2 = _____

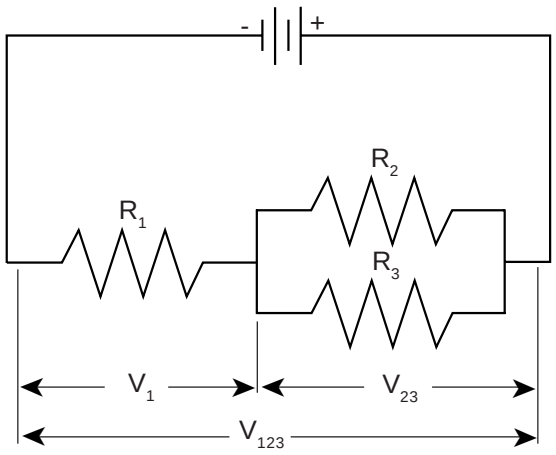
R_3 = _____ V_3 = _____

R_{123}= _____ V_{123}= _____

Figure 5.2

④ Now connect the circuit below and measure the voltages. You can use the resistance readings you took in Experiment 4 for this step.

Combination



R_1 = _____ V_1 = _____

R_{23} = _____ V_{23} = _____

R_{123} = _____ V_{123} = _____

Figure 5.3

⑤ Use the three unequal resistors that you used in Experiment 4 to construct the circuits shown below. Make the same voltage measurements that you were asked to make before in steps 1 to 4. Use the same resistors for A, B and C that you used in Experiment 4.

Series

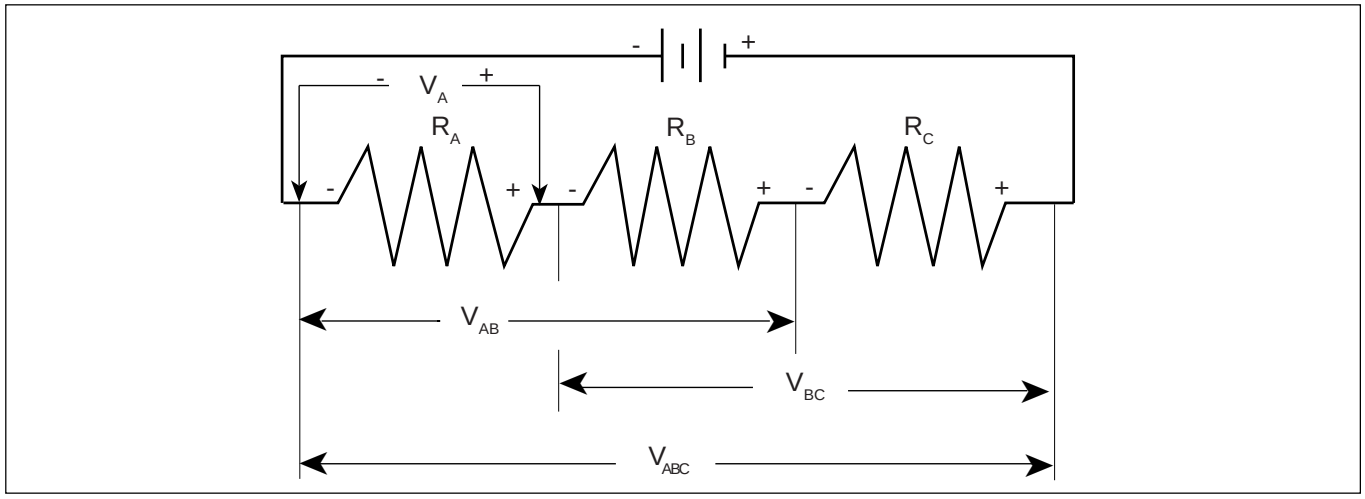


Figure 5.4

R_A = _____ V_A = _____

R_B = _____ V_B = _____

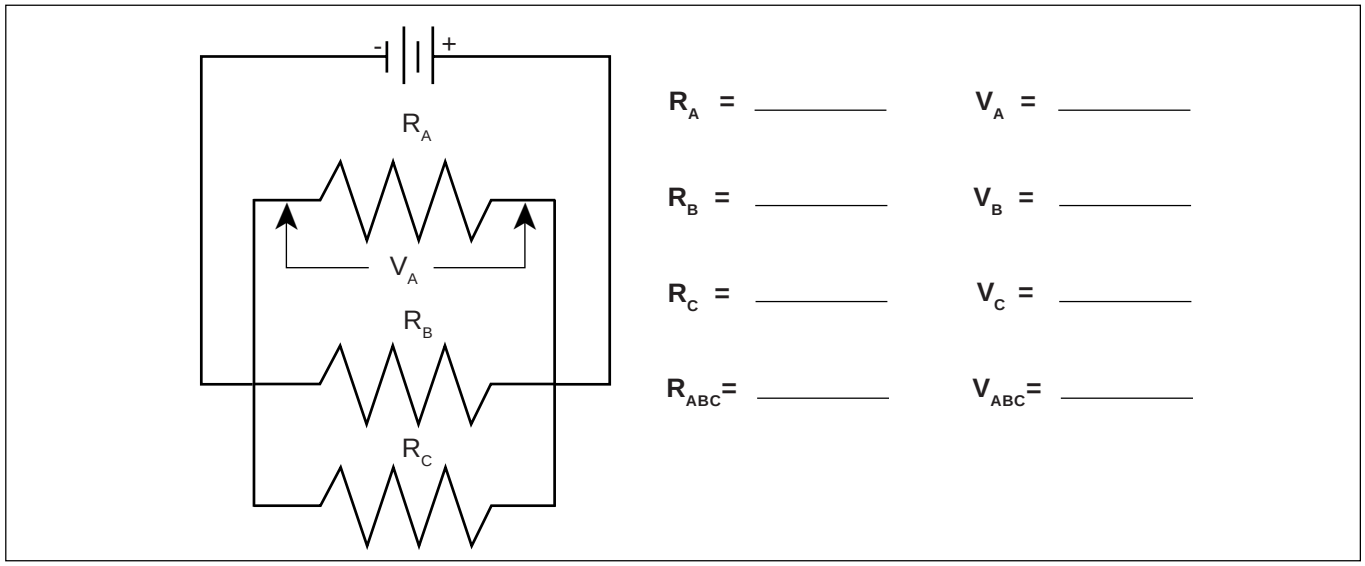
R_C = _____ V_C = _____

R_{AB} = _____ V_{AB} = _____

R_{BC} = _____ V_{BC} = _____

R_{ABC} = _____ V_{ABC} = _____

Parallel



R_A = _____ V_A = _____

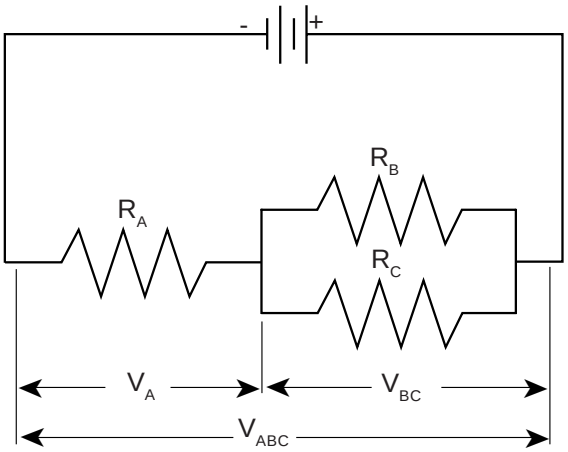
R_B = _____ V_B = _____

R_C = _____ V_C = _____

R_{ABC} = _____ V_{ABC} = _____

Figure 5.5

Combination



R_A = _____ V_A = _____

R_{BC} = _____ V_{BC} = _____

R_{ABC} = _____ V_{ABC} = _____

Figure 5.6

Discussion

On the basis of the data you recorded on the table with Figure 5.1, what is the pattern for how voltage gets distributed in a series circuit with equal resistances? According to the data you recorded with Figure 5.4, what is the pattern for how voltage gets distributed in a series circuit with unequal resistances? Is there any relationship between the size of the resistance and the size of the resulting voltage?

Utilizing the data from Figure 5.2, what is the pattern for how voltage distributes itself in a parallel circuit for equal resistances? Based on the data from Figure 5.5, what is the pattern for how voltage distributes itself in a parallel circuit for unequal resistances? Is there any relationship between the size of the resistance and the size of the resulting voltage?

Do the voltages in your combination circuits (see Figures 5.3 and 5.6) follow the same rules as they did in your circuits which were purely series or parallel? If not, state the rules you see in operation.