Kirchhoff's Rules Experiment

I. INTRODUCTION

1.1. Kirchhoff 's rules

Ee can analyze simple circuits using the expression $V = IR$ and the rules for series and parallel combinations of resistors. Very often, however, it is not possible to reduce a circuit to a single loop. The pro- cedure for analyzing more complex circuits is greatly simplified if we use two principles called Kirchhoff 's rules:

The sum of the currents entering any junction in a circuit must equal the sum of the currents leaving that junction:

$$\sum I_{\text{in}} = \sum I_{\text{out}} \qquad \textbf{(28.9)}$$

The sum of the potential differences across all elements around any closed circuit loop must be zero:

$$\sum_{\substack{\text{closed}\\ \text{loop}}} \Delta V = 0 \qquad \textbf{(28.10)}$$

Kirchhoff's first rule is a statement of conservation of electric charge. All current that enters a given point in a circuit must leave that point because charge cannot build up at a point. If we apply this rule to the junction shown in Figure 1. we obtain

$$I_1 = I_2 + I_3$$

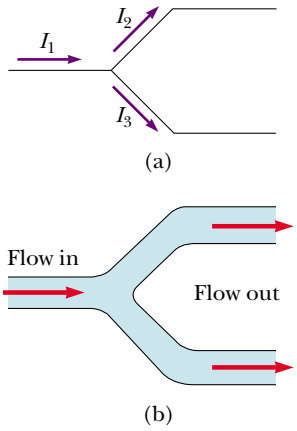


Figure 1. Kirchhoff's junction rule.

Kirchhoff's second rule is a statement of conservation of energy, we imagined carrying a charge around a loop. When applying this rule, we imagine *traveling* around the loop and consider changes in *electric potential,* rather than the changes in *potential energy* described in the previous paragraph. You should note the following sign conventions when using the second rule:

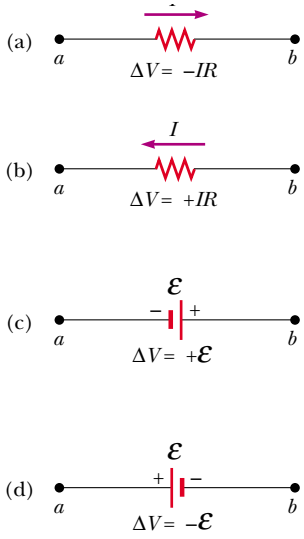


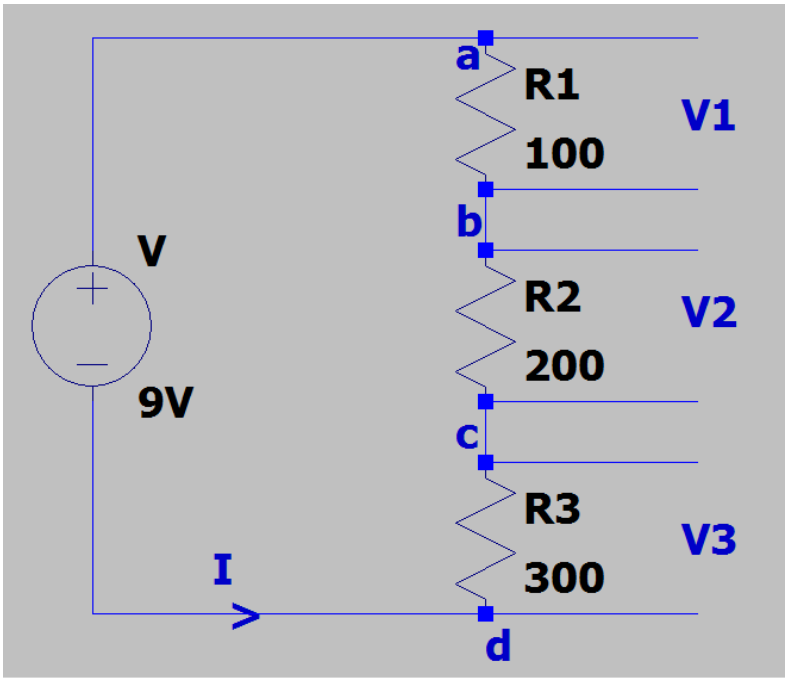
Figure 2. Kirchhoff's voltage rule

II.APPARATUS

Resistance, cables, multimeter, basic electrical set.

III. EXPERIMENTAL PROCEDURE

3.1 Kirchhoff's loop rule



1) Set up the circuit provided on the up side.

2) If you have one multimeter, prepare it for 2 situations. You can use your multimeter for measuring current and voltage.

3) Please make the connection of power supply.

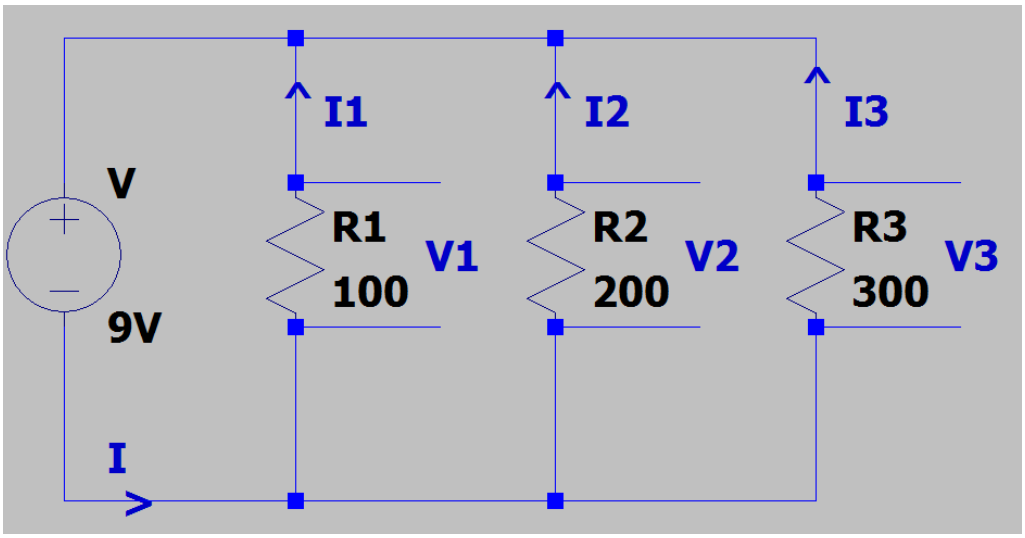
4) Do not forget that Ammeters are connected in series so that the current flows through them. The ideal ammeter has a resistance of zero.Voltmeters are connected in parallel to resistive elements in the circuit so that they measure the potential difference across (on each side of) the element.

5) In this experiment, please fill the Table 1 for this circuit.

6) Please make some conclusion about loop rule by using your experimental data.

Table1				
V (V)	**I (A)**	**V1 (R1)**	**V2 (R2)**	**V3 (R3)**
9				

3.2 Kirchhoff's junction rule



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5) In this experiment, please fill the Table 2 for this circuit.

6) Please make some conclusion about junction rule by using your experimental data.

Table2

V (V)	I (A)	I1 (A)	I2 (A)	I3(A)	V1 (R1)	V2 (R2)	V3 (R3)
9							

Ref.

1) Serway, R, Beichner,R. Physics for Scientists ans engineers with modern physics, Fifth edition. 2000.
2) Rentech.Experiments in electricity, student guide. 2013.