Loop law

Student Group

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Loop law

Kirchhoff's voltage law: In every closed loop of an electrical network, the sum of all voltages is zero.

Set the voltage on the power supply to $12 ~{\rm V}$ and measure this voltage accurately using a multimeter. Build the measurement circuit shown in figure 1.

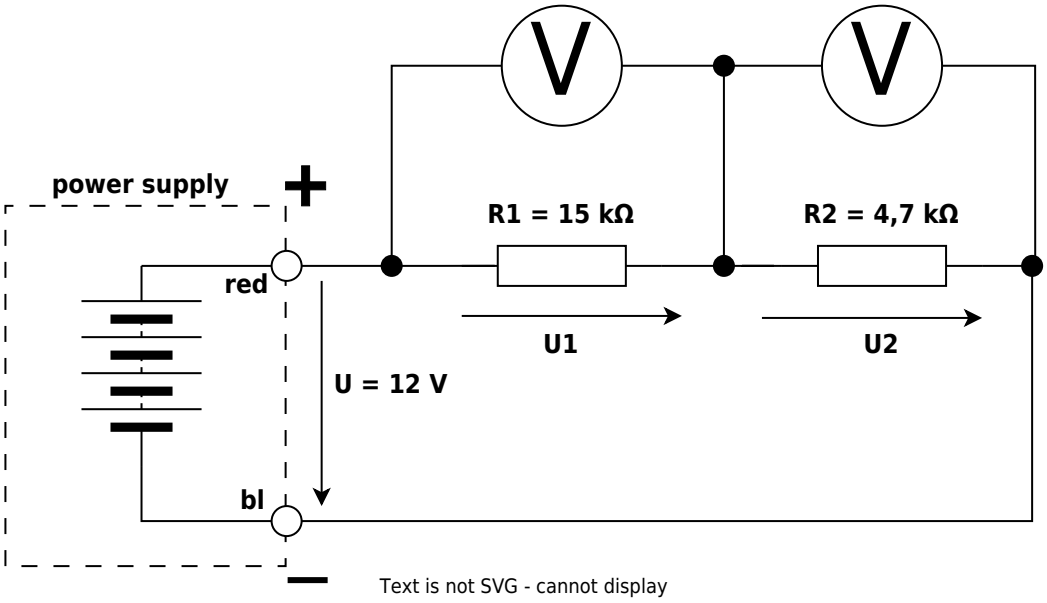

Fig. 1: Verification of Kirchhoff's voltage law

Add the voltage arrows and measure U, $U_{\rm 1}$ and $U_{\rm 2}$.

$$U$$	$$U_{~\rm	$$U_{~\rm...

Tab. 1: Voltage measurement for Kirchhoff's voltage law

What is the loop equation here?

Verify the equation using the measured values.

The resistors $R_{\rm 1}$ and $R_{\rm 2}$ connected in series form a voltage divider. In what ratio are the voltages $U_{\rm 1}$ and $U_{\rm 2}$?

$\frac{U_{\rm 1}}{U_{\rm 2}} =$

Node law

Kirchhoff's current law: At every node, the sum of all currents flowing into and out of the node is zero.

Set the voltage on the power supply to $12 ~{\rm V}$ and measure the voltage accurately using a multimeter. As a first step, build the measurement circuit shown in figure 2.

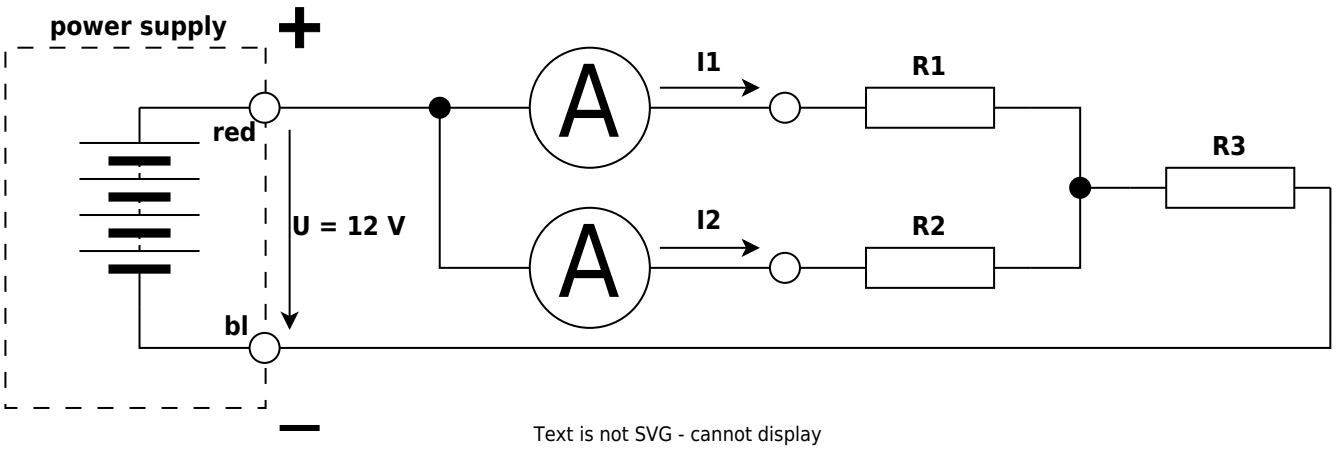

Fig. 2: Branch currents for verification of Kirchhoff's current law

Add the arrows indicating the directions of currents $I_{\rm 1}$ and $I_{\rm 2}$. On both multimeters, set the DC current range and the polarity before switching on. Then measure currents $I_{\rm 1}$ and $I_{\rm 2}$ and enter the measured values in the table.

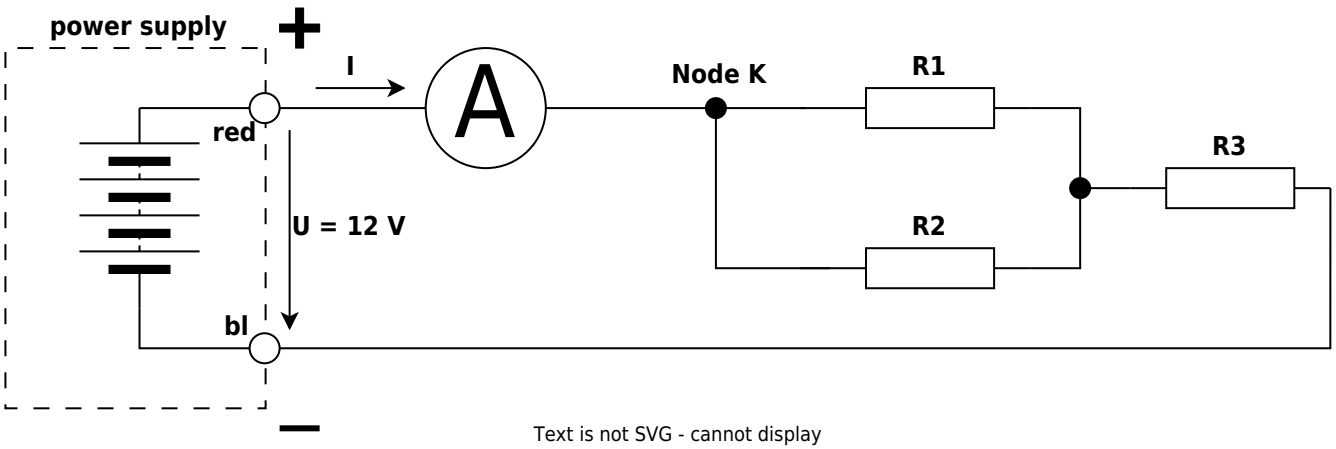

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Fig. 3: Total current and node K

In what ratio are currents $I_{\rm 1}$ and $I_{\rm 2}$?

$\frac{I_{\rm 1}}{I_{\rm 2}} =$

Switch the power supply on again and measure the current I. Enter its value in the table.

$$I$$	$$I_{~\rm..$$I_{~\rm...

Tab. 2: Current measurement for Kirchhoff's current law

Determine the node equation for node K and verify its validity.

Using the measured values of resistors $R_{\rm 1}$, $R_{\rm 2}$ and $R_{\rm 3}$, calculate the total resistance $R_{\rm KP}$.

Using the calculated value of $R_{\rm KP}$, verify the measured value of the total current:

$I = \frac{U}{R_{\rm KP}} =$