

Loop law

Student Group

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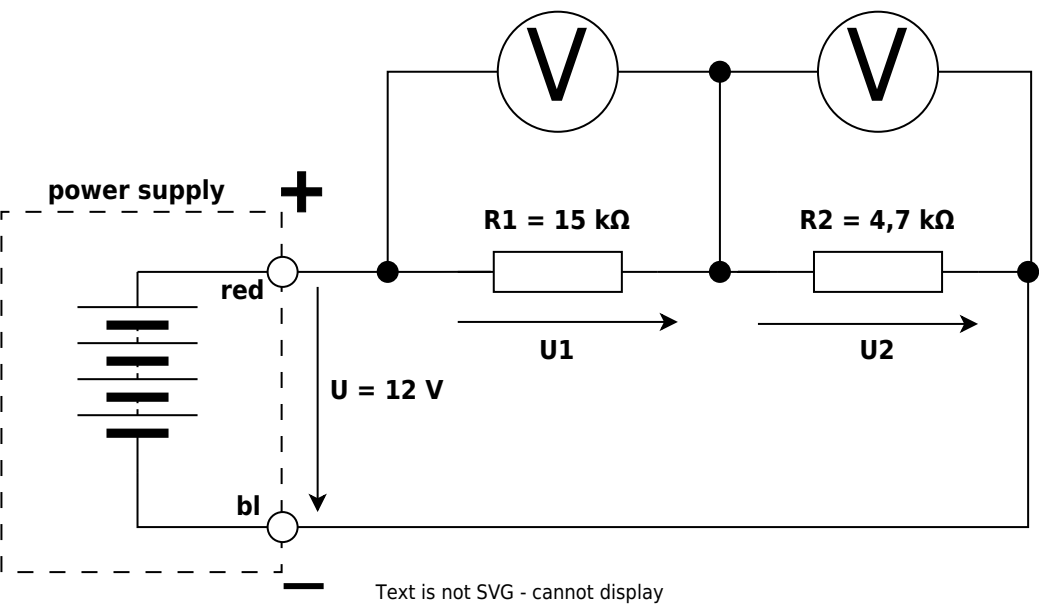
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Loop law

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 V and measure this voltage accurately using a multimeter. Build the measurement circuit shown in [figure 1](#).



Kirchhoff's voltage law

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

U	U_{1}	U_{2}

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 V and measure the voltage accurately using a multimeter. As a first step, build the measurement circuit shown in [figure 2](#).

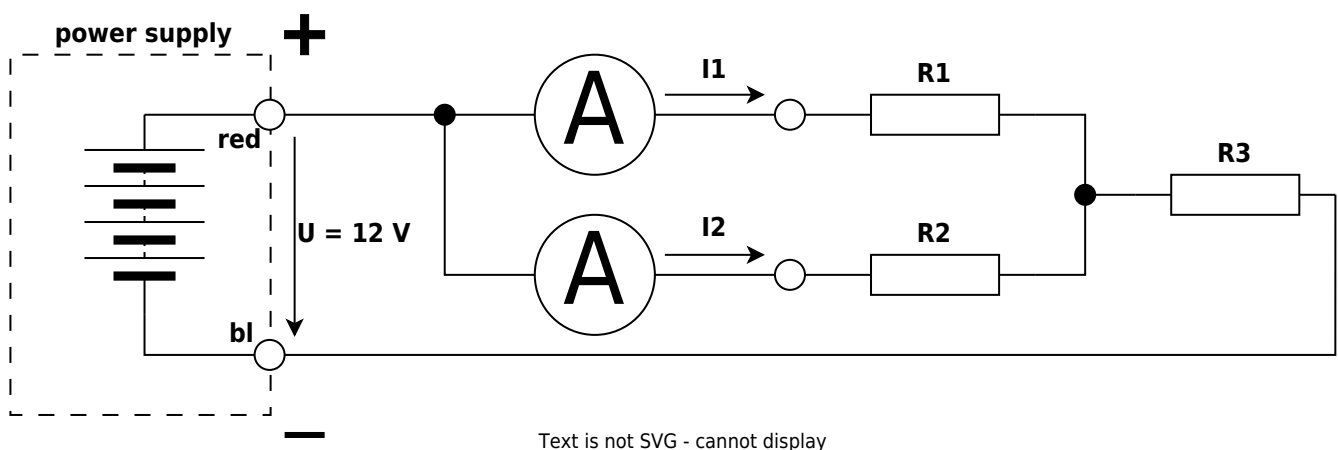


Fig. 2: Branch currents for verification of Kirchhoff's current law

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.

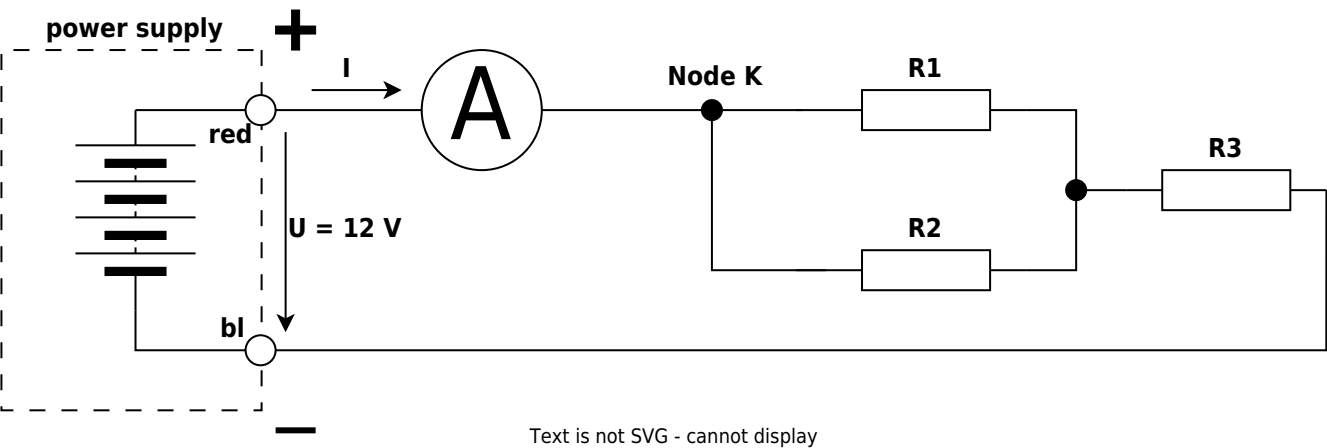


Fig. 3: Total current and node \$K\$

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

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:

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

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