

Loop law

Student Group

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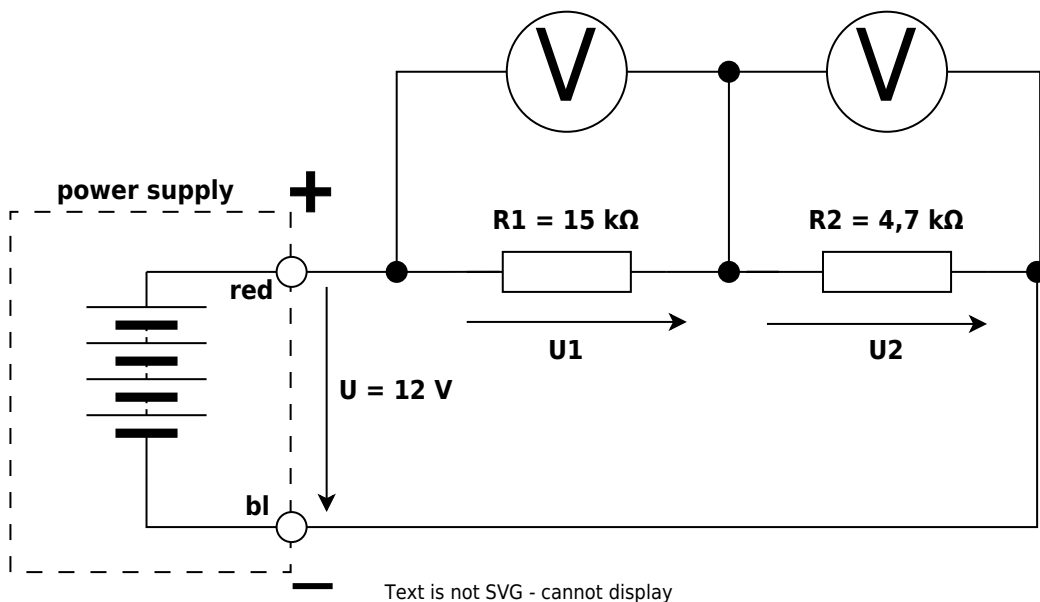
Table of Contents

Loop law 2
Node law 3

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.



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Fig. 1: Verification of

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_{1} and R_{2} connected in series form a voltage divider. In what ratio are the voltages U_{1} and U_{2} ?

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

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](#).

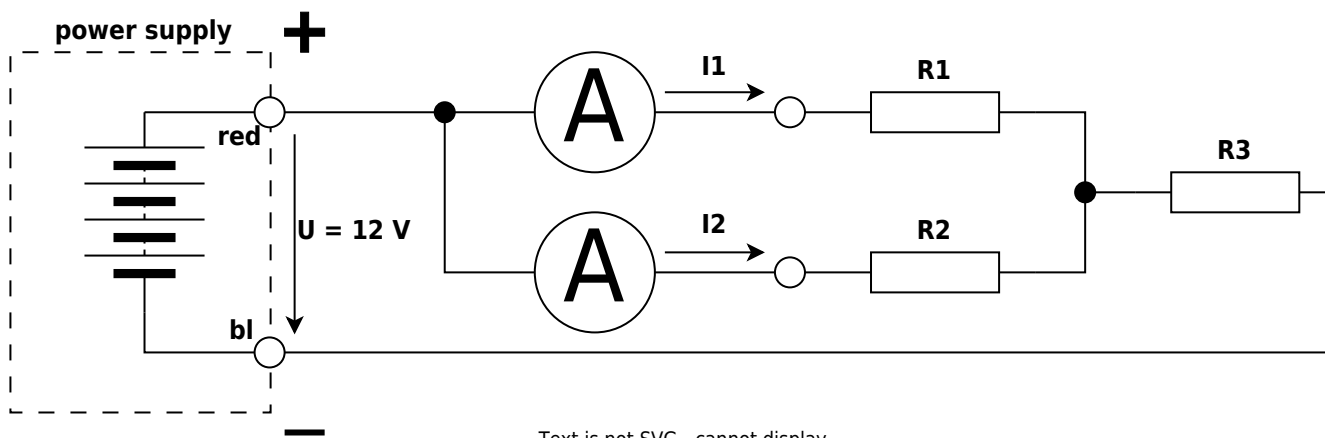
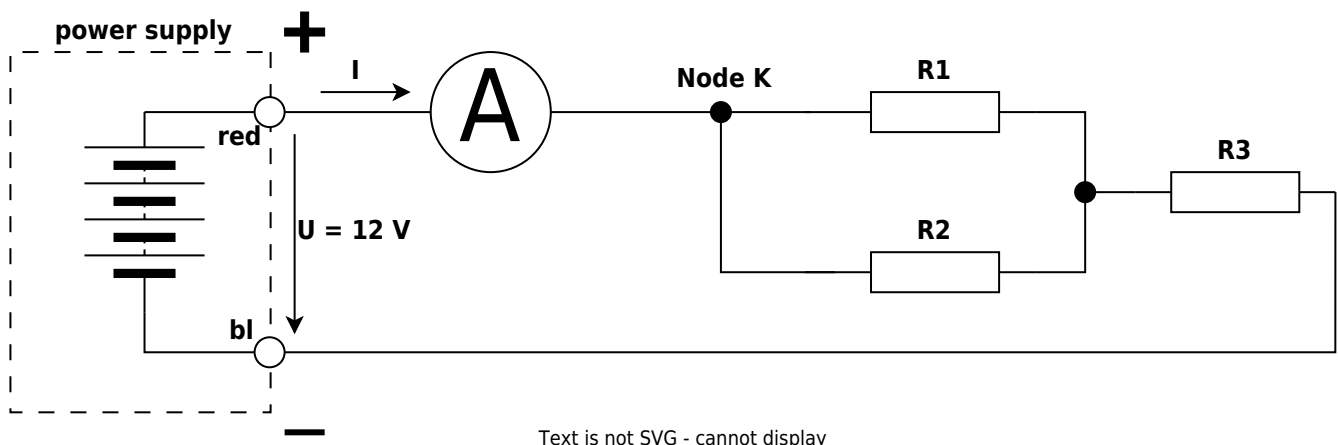


Fig. 2: Branch currents for verification of Kirchhoff's current law

Add the arrows indicating the directions of currents I_{1} and I_{2} . On both multimeters, set the DC current range and the polarity before switching on. Then measure currents I_{1} and I_{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_{R1} and I_{R2} ?

$$\frac{I_{\text{R1}}}{I_{\text{R2}}} =$$

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

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_{1} , R_{2} and R_{3} , calculate the total resistance R_{KP} .

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

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

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