ROQED PHYSICS LAB

Study of the mixed connection of conductors

Purpose: to study the operation of electrical circuits with a mixed connection of current consumers.

Equipment:

041 - voltmeter (3 pcs.),

Resistors 2, 3 Ohm

043 - power supply,

Connecting wires
Ammeters 3 pcs.
Key

Theory:

Many electrical circuits use a mixed connection of conductors, which is a combination of serial and parallel connections.

A series connection of resistances is a connection in which the end of the first resistance is connected to the beginning of the second, the end of the second - to the beginning of the third, etc.

The total resistance of series-connected resistors is equal to the sum of their resistances.
Rtot. = R_1+ R_2+ R_3

The magnitude of the current in the series circuit:
$I = I_1 = I_2 = I_3 = \text{const}$

The voltage of the current source applied to the external section of the circuit is distributed over the sections of the circuit in direct proportion to the resistances of these sections.
$U_{total} = U_1 + U_2 + U_3$
The sum of the voltages in the sections of the serial circuit is equal to the voltage of the current source

In parallel connection, the total resistance is determined by the formula:

$$\frac{1}{R_{общ}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_n}$$

With parallel connection of the resistances, the voltages across them are equal to each other.

$$U_1 = U_2 = U_3$$

The magnitude of the current is the sum of the currents of individual sections of the circuit.

$$I = I_1 + I_2 + I_3$$

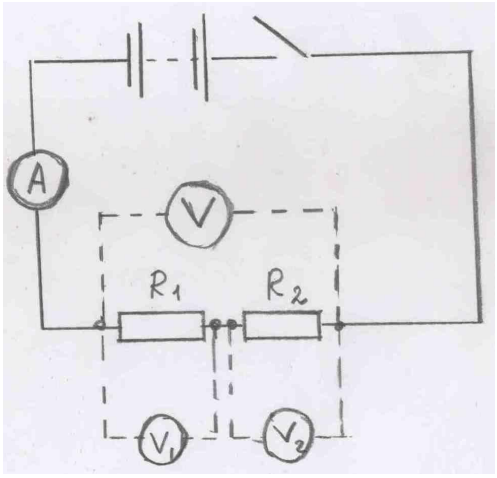
To the board

Many electrical circuits use a mixed connection of conductors, which is a combination of series and parallel connections.

The order of the work.

1. It is necessary to collect 2 electrical circuits. After assembling the circuit, run the simulation. Voltage will appear in the voltage source and the measuring instruments will show the corresponding data.

2. Assemble the electrical circuit No. 1 shown in the figure. Start simulation. Enter the readings of the measuring devices into table # 1.



3. Make a formula to calculate the total voltage of the electrical circuit depending on the voltage across the resistors R1 (U_1) and R2 (U_2).
$U_{total} = U_1 + U_2$.

4. Make a formula to calculate the total resistance of the electrical circuit depending on voltage (Utotal) and current (Itotal).
$R_{total}1 = \frac{Utotaltotal}{I}$

5. Make a formula to calculate the total resistance of the electrical circuit depending on the resistances across the resistors R1 (R_1) and R2 (R_2).
$R_{total2} = R_1 + R_2$

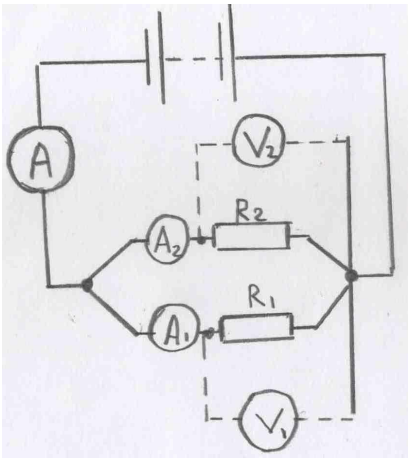
6. Compare According to the table №1 $\frac{U1}{U2}$ and $\frac{R1}{R2}$

7. Repeat the experiment two times, changing the place where the ammeter is connected.

8. Table # 1.

№ experience	strength of current I, A	Voltage U, V	Resistance R_1ohm	resistance R_2ohm	voltage at the first resistor U_1, V	Voltage on the second rezistoreU 2,	$U_{commonly}$	R_{obsch1}	R_{obsch2}	$\frac{U1}{U2}$	$\frac{R1}{R2}$
1.											
2.											

9. Assemble the electrical circuit No. 2 shown in the figure. Start simulation. Enter the readings of the measuring devices in table # 2.



10. Make a formula to calculate the total current in the electrical circuit depending on the current across the resistors R1 (I_1) and R2 (I_2).
$I_{total} = I_1 + I_2$.

11. Make a formula for calculating the total resistance of the electrical circuit depending on voltage (Utotal) and current (Itotal).
$R_{total}1 = \frac{Utotaltotal}{I}$

12. Make a formula to calculate the total resistance of the electrical circuit depending on the resistances across the resistors R1 (R_1) and R2 (R_2).
$R_{total2} = \frac{R1R2}{R1+R2}$

13. Compare the table №2 $\frac{I1}{I2}$ and $\frac{R2}{R1}$.

14. Repeat the experiment, changing the voltage value at the voltage source.

15. Table 2.

Experiment No.	Current I_1, (A)	Current I_2, A	Current $I_{total} = I_1 + I_2$	Voltage U_{total}, V	R_{total}	Resistance R_{11}, Ohm	Resistance R_2, Ohm	$R_{total\ 2}$	$\frac{I1,}{I2}$	$\frac{R2}{R1}$
1										
2..										

16. Make a conclusion.
A. When the conductors are connected in series, the current through each element of the circuit is the same, and the voltage is the sum of the voltages at each section of the circuit. With parallel connection of conductors, the voltage on each element of the circuit is the same, and the current

strength is equal to the sum of the currents in each section.

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FROM. When the conductors are connected in series, the current and voltage through each element of the circuit are the same. With parallel connection of conductors, the voltage on each element of the circuit is the same, and the current strength is equal to the sum of the currents in each section.