SCENARIO	
Title	**Ohm's law.**
Summery	During the course, students will become familiar with the concept of electrical resistance. The definition of electrical resistance and its unit will be introduced. They will know Ohm's law. In practical activities, they will determine the electrical resistance of a resistor using a voltmeter and ammeter. In order to consolidate knowledge, they will solve tasks regarding electrical resistance and Ohm's law.
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Didactic objectives
General objectives: Introduction of the concept of electrical resistance. Introduction of the definition of electrical resistance and its unit. Experimental determination of the electrical resistance of a resistor using a voltmeter and ammeter. Knowing Ohm's law. Solving problems related to electrical resistance and Ohm's law.   Specific lesson objectives: Students will be able to: use the concept of electrical resistance as the value characterizing a conductor, explain what the electrical resistance depends on, plan the experience associated with determining the electrical resistance of a resistor using a voltmeter and ammeter, apply Ohm's law in simple electrical circuits, read data from the table and save the data in the form of a table, make a graph of the current dependence on the applied voltage based on data from the table,

determine the receiver resistance using an ammeter and voltmeter,

solve accounting tasks regarding electrical resistance.

| Physics ☒ | Mathematics ☐ | Information Technology ☐ | Robotics ☐ | Programming ☐ |

Education Level: 10-12 years ☐ 12-14 years ☒

Problem Statement

- What is electrical resistance?

- How to determine electrical resistance using a voltmeter and ammeter?

- What is Ohm's law?

BOM (Bill Of Materials needed)

- computer station

- SCRATCH environment installed or Internet access

- instruments for experiments: elements for the construction of electrical circuits, including resistors of

different resistance, light bulbs.

Activity description

Lesson flow:

1. Organizational and cleaning activities
2. Introduction to the topic - an attempt to answer the question whether there is a relationship between voltage and current in an electrical circuit
3. Performing the experiment using a circuit with varying voltage.
4. Measurement of voltage and current of various electrical components and drawing conclusions
5. Introduction and discussion of the concept of electrical resistance - based on the results of the experiment
6. Introduction of the unit of electrical resistance and the formula: $R = U / I$
7. Discussion: What determines the electrical resistance.
8. Experimental study on what the electrical resistance of a conductor depends on.
9. Discussion of Ohm's law based on the results of experiments
10. Simulation of Ohm's law using the SCRATCH

Resources

- computer stadion

- SCRATCH environment installed or Internet Access
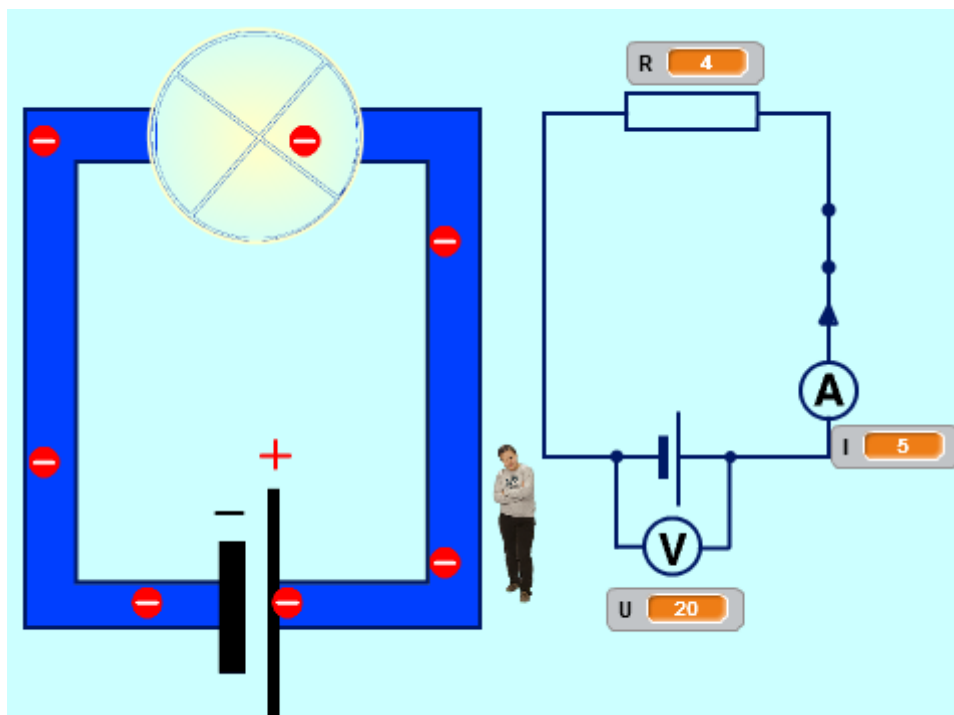
```
when [green flag] clicked
switch backdrop to tło1
set size to 30 %
go to x: 15 y: -78
set I to 0
set U to 0
set R to 0
ask Enter the voltage value and wait
set U to answer
ask Enter the resistance value and wait
set R to answer
wait 2 secs
broadcast komunikat1
switch backdrop to tło2
set I to (U / R)
```

```
when I receive komunikat1
hide
wait 1 secs
forever
  create clone of myself
  wait 0.5 secs
```

```
when I start as a clone
point in direction -90
go to x: -130 y: -120
show
forever
  move 10 steps
  if <touching color [ ]?> then
    turn ↻ 90 degrees
  if <touching color [ ]?> then
    wait 0.25 secs
    delete this clone
```

11. Solving problems related to Ohm's law.

Drawing graphs of the dependence of electric current on voltage; reading information from graphs for cases in which Ohm's law is fulfilled

12. Summary and end of the lesson.

Students' Evaluation
The student will be assessed in writing for his commitment and proper performance of the experiments.

Bibliography
Spotkania z fizyką - Podręcznik do fizyki dla klasy ósmejj szkoły podstawowej Authors: Grażyna Francuz-Ornat, Teresa Kulawik, Maria Nowotny-Różańska https://scratch.mit.edu

Scalability
Script modification and improvement.

More information
Solving tasks using the program.