

Blank Activity Template

Yellow highlight = required component

Subject Area(s) Physics
Associated Unit Electric Circuits
Associated Lesson Resistor Circuits
Activity Title Series and Parallel Connections

Header

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Grade Level 12 (10-12)

Activity Dependency

Time Required 45 minutes

Group Size

Expendable Cost per Group US \$___

Summary

Students work on implementing parallel and series circuit connections. They will learn how to measure voltage, current, resistance and power in both configurations.

Engineering Connection

Resistor circuits make the basis elements of circuit analysis and design fields in Electrical Engineering. Understanding resistor circuits and resistor connection is crucial for analysis and design of electrical systems.

Engineering Category =

Choose the category that best describes this activity's amount/depth of engineering content:

1. Relating science and/or math concept(s) to engineering
2. Engineering analysis or partial design
3. Engineering design process

Keywords

Resistors, Ohm's Law, Parallel Connection, Series Connection, Resistor Circuits.

Educational Standards

National and State

Choose standards from <http://asn.jesandco.org/resources/ASNJurisdiction> or [browse educational standards](#) on TeachEngineering.

State/national science/math/technology (provide source, year, number[s] and text):

ITEEA Educational Standard(s)

[ITEEA](#) (provide standard number, grade band, benchmark letter and text):

Pre-Requisite Knowledge

Learning Objectives

After this activity, students should be able to analyze the relationship between:

- Potential difference in series and parallel circuits
- Current in series and parallel circuits
- Resistance in series and parallel circuits

Materials List

Each group needs:

- battery or power supply
- resistors
- ammeter
- multimeter/voltmeter
- alligator wire
- momentary contact switch (optional)
- light bulb

To share with the entire class:

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Introduction / Motivation

As an electrical engineer, you would be asked to design and implement circuit connections and figure out whether they are working properly or not. You will need to conduct measurements and calculations. In order to achieve, you will need to know how measurement tools such as multimeters and voltmeters can be used.

Vocabulary / Definitions

Word	Definition

Procedure

Background

Before the Activity

- Review series and parallel circuit connections.

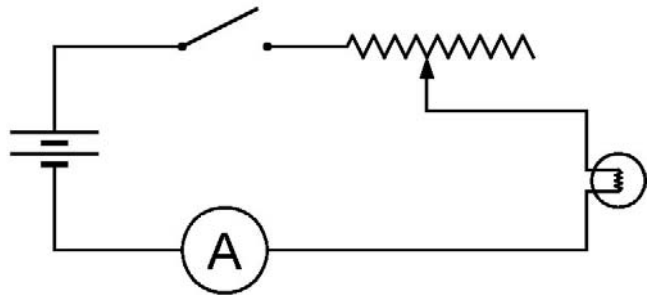
With the Students

1. Wire the circuit shown below. Remember to begin with the ammeter on its highest range. Connect the positive terminals of the meters closest to the positive side of the battery. Use the digital multimeter to read the potential difference across the resistor R_1 and record in the data table. Use Ohm's Law to calculate the resistance of R_1 . Record the rated resistance using the color code and calculate the relative error.
2. Repeat the procedure for resistor R_2 .
3. Repeat the procedure this time using R_1 and R_2 in series. Calculate the series resistance using the rated values of resistance and then calculate the relative error.
4. Repeat the procedure using R_1 and R_2 in parallel. Calculate the parallel resistance using the rated values of resistance and then calculate the relative error.

DATA AND CALCULATIONS TABLE

TRIAL	V	I	R	Rated Value	Relative Error
1					
2					
3					
4					

5. Wire the circuit shown below. Remember to begin with the ammeter on its highest range. Connect the positive terminals of the meters closest to the positive side of the battery. Adjust the rheostat to its maximum resistance so that only a small current flows through the light bulb. Use the digital multimeter to read the potential difference across the light bulb and record in the data table. Use Ohm’s Law to calculate the resistance of the light bulb and the power it is dissipating.



6. Now adjust the rheostat so that the bulb is glowing a very dim red-orange light and measure its voltage and current. Calculate the resistance and power.
 7. Now adjust the rheostat to its minimum resistance so that the bulb glows brightly. Measure the voltage and current. Calculate the resistance and power.
 8. Write down the calculations, answers and equations used in the previous steps.

Image Insert Image # or Figure # here (use Figure # if referenced in text)

<p>Figure 1 Image file: ___? ADA Description: ___? Source/Rights: Copyright © ___? Caption: Figure 1: ___?</p>

Attachments

Safety Issues

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Troubleshooting Tips

Investigating Questions

Assessment

Pre-Activity Assessment

Descriptive Title: None

Activity Embedded Assessment

Descriptive Title: None

Post-Activity Assessment

Descriptive Title: Collect answer sheets of question 8 in the procedure.

Activity Extensions

Activity Scaling

- For lower grades, ___?
- For upper grades, ___?

Additional Multimedia Support

References

Other

Redirect URL

Contributors

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Supporting Program

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Classroom Testing Information