

Investigating combinations of resistors and their use in potential divider circuits

Introduction

In this experiment you will be calculating the value of a number of different resistor combinations and then comparing these to an actual value taken from a multimeter reading. You will then study how the potential difference is distributed around the circuit and look to link this to the electrical properties of the components.

Aim

- To draw resistor combinations
- To calculate the combined value for resistance of the combination
- To compare this with a measured value
- To investigate potential difference around the circuit

Intended class time

- 45 to 60 minutes

Equipment (per group)

A) Combining resistors

- 5 different values of resistor
- multimeter measuring resistance in ohms
- leads
- crocodile clips (if using unmounted components)

B) Potential and potential difference across resistors in a circuit

- 5 resistors (to be used in combinations of 3)
- power supply set at 5 V
- 3 voltmeters

Health and safety

- Safe use of electrical circuits
- Do not use the power supply whilst carrying out experiment A

Procedure

A) Combining Resistors

1. Connect at least 3 resistors in a circuit and sketch the arrangement.
2. Calculate the effective value of the combination showing your working.
3. Measure the value of the combination using the multimeter.
4. Compare your calculation to the measured value.
5. Repeat the experiment so that you have one series combination, one parallel combination and three combinations including series and parallel arrangements.

CIRCUIT DIAGRAM	CALCULATIONS	MEASUREMENT

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B) Potential and potential difference across resistors in a circuit

1. Set up a circuit with 3 resistors in series and a voltmeter across each one.
2. Draw a full circuit diagram. Maintain the power supply output at 5V throughout the experiment.
3. Mark on the diagram the e.m.f. of the power supply, and the potential difference across each resistor.

4. Complete the table below:

	Resistor 1	Resistor 2	Resistor 3	Total
Resistance / Ω				
% of total				100%
Potential difference / V				
% of total				100%

5. Repeat the experiment with different resistors:

6. Complete the table below:

	Resistor 1	Resistor 2	Resistor 3	Total
Resistance / Ω				
% of total				100%
Potential difference / V				
% of total				100%

7. Draw conclusions as to how potential difference is distributed across the components in a series circuit.

Extension Opportunities

Identify the negative terminal of the supply and mark this as 0V. Mark the actual *potential* in volts at each connection in the circuit and explain how the terms *potential* and *potential difference* are linked.

Recording

As evidence for the Practical Endorsement you should have the data collected from your group in a clear and logical format. All work should be clearly dated.

In addition, in preparation for the assessment of practical work in the written examinations and to help you develop your understanding, you should have calculated values to complete the tables given, or produced a version of this in your laboratory record book.

You should have drawn conclusions from the measurements taken.