

Greatest Current Lab

Teacher's Guide

Topic:

Electric Circuits

The following information is provided to the student:

Question:

Where is the rate of charge flow within a simple circuit the greatest? ... the least? ... or is it everywhere the same?

Purpose:

To determine location within a simple circuit (if anywhere) where the rate of charge flow is the greatest.

A complete lab write-up includes a Title, a Purpose, a Data section, and a Conclusion. The Data section should include a diagram of the simple circuit and the measurements and/or observations which were made. Measurements and/or observations should be clearly documented. The Conclusion should answer the *question* posed in the Purpose of the lab and identify the supporting evidence which validates the answer.

Materials Required:

Compass; two or three D-cells; battery holder; alligator leads; small ~3 V bulbs (or similar bulb); bulb bases.

Description of Procedure:

Students build a two-bulb circuit. They place a magnetic compass underneath one of the wires. With the circuit open, they align the wire with the compass needle. They then close the circuit and observe the amount of deflection of the compass needle. They repeat the process of opening and closing the circuit to insure a relatively accurate reading (within 5-10 degrees). They then repeat the measurement for other wires.

Alternative Materials and Procedure:

The compasses can be replaced by ammeters. This provides an early introduction to the use of quantitative measurements of electrical quantities such as current.

Safety Concern:

There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that the working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

Suggestions, Precautions, Notes:

1. In advance of the lab, inform students that charge flowing through a wire can create a magnetic field which alters the direction of a compass needle. The rate at which the charge flows will effect

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the amount of deflection of the needle. A greater rate of charge flow correlates with a greater deflection of the compass needle.

2. Students may have some difficulty with the procedure. Monitor their activity carefully, providing guidance where needed.
3. Consider pooling class conclusions. Draw a two bulb circuit on the board; identify the + terminal of the battery and label the wires as A, B and C. Then ask students to commit to one of the following conclusions:
 - The rate of charge flow was greatest in wire A.
 - The rate of charge flow was greatest in wire B.
 - The rate of charge flow was greatest in wire C.
 - There is no noticeable difference in flow rate for the three wires.
4. This activity and the previous two can be used to begin building a proper model of charge flow in electric circuits. Be aware that students enter the class with preconceptions which will have to be directly challenged in order to be dispelled. Ask students to reflect on what they believe and why they believe it. A page at The Physics Classroom Tutorial may serve useful in encouraging students to reflect on their beliefs: <http://www.physicsclassroom.com/Class/circuits/u9l2d.cfm>.

Auxiliary Materials:

None

Scoring Rubric:

C3. Greatest Current Lab	Score
— Included, labeled and organized all parts of the lab report. — Data section includes a diagram of the simple circuit which was tested; measurements, observations and other results are clearly documented; data is pertinent to the Purpose. — Conclusion answers the <i>question</i> posed in the Purpose; <i>answer</i> is correct and consistent with the Data section. Evidence which provides support for the answer is clearly identified and discussed.	—/—

Connections to The Physics Classroom Tutorial:

The following readings are a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/Class/circuits/u9l2a.cfm>

<http://www.physicsclassroom.com/Class/circuits/u9l2b.cfm>

<http://www.physicsclassroom.com/Class/circuits/u9l2d.cfm>

Connections to Minds on Physics Internet Modules:

Sublevel 1 of the Electric Circuits module is a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/mop/module.cfm>