

Sparky the Electrician Lab

Teacher's Guide

Topic:

Electric Circuits

The following information is provided to the student:

Question:

What are the two requirements for an electric circuit?

Purpose:

To identify the four successful arrangements of wire, bulb and battery which successfully light a bulb and a couple of unsuccessful arrangements AND to describe the commonalities of those arrangements by identifying the two requirements for an electric circuit.

A complete lab write-up includes a Title, a Purpose, a Data section, a Conclusion and a Discussion of Results. The Data section includes sketches of the four successful arrangements and at least two unsuccessful arrangements. The Conclusion describes the two requirements for an electric circuit. The Discussion of Results should explain why the unsuccessful arrangements were unsuccessful in terms of how they fail to meet the requirements; and uses one of the successful arrangements to elaborate on the meaning of each requirement.

Materials Required:

D-cell; wire; bulb.

Description of Procedure:

Students work in pairs to find four arrangements of a D-cell, a wire and a bulb that result in the lighting of the bulb. Each successful arrangement is diagrammed and students identify two commonalities which all arrangements have in common.

Alternative Materials and Procedure:

Alternative materials and procedures are not recommended.

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. Many students will have great difficulty with finding a first successful arrangement. No matter how tempting, do your best to not intervene. The AHA moment is more intense if you do not.
2. After a good 10 minutes of no success, consider a very short presentation on the anatomy of a light bulb; center the presentation around [a diagram](#) such as that found in The Physics Classroom Tutorial.

The Laboratory

3. Once lab groups find their first successful arrangements, the remaining three arrangements come quite quickly. Arrangements which touch the ribbed edge of the bulb to the D-cell are considered different than those which touch the bottom of the bulb to the D-cell. Arrangements which touch the bulb to the positive terminal of the D-cell are considered different than those which touch the bulb to the negative terminal of the D-cell.
4. Emphasize in the post-lab that the D-cell is simply an energy supply and that any energy supply will do. If a Genecon is available, you might demonstrate the use of a Genecon to power a circuit by replacing the battery with it. Ask students what the source of energy is for the new circuit.
5. Genecons are available from many science supply stores. Conduct a Google search to find a Genecon like the one featured at [Arbor Scientific](#).

Auxiliary Materials:

None

Scoring Rubric:

| C1. Sparky the Electrician Lab | Score |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <ul style="list-style-type: none">___ Included, labeled and organized all parts of the lab report.___ Data section includes informative and labeled sketches of four successful arrangements and of two unsuccessful arrangements.___ Conclusion clearly and accurately describes the two requirements for an electric circuit.___ Discussion of Results uses the two requirements to explain why the unsuccessful arrangements were unsuccessful and why the successful arrangements were successful. | ___/___ |

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>

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>