

Experiment 6-Electric Light Bulb Experiment

In this lab, you will be given a battery, a small light bulb, and copper wire. By experiments, you will develop a working understanding of how the battery and bulb must be connected so that the bulb will light. Various arrangements of the battery and bulb will be evaluated.

You will first evaluate your own conceptions with a short quiz about how best to configure a battery to light a bulb. Activities in which the student is actively questioning the objectives typically result in a more complete learning experience.

Part A- Simple Electronic Circuits

Hypothesis: How can we get a bulb to light up?

Materials: D cell batteries, 2.5 Volt light bulbs, insulated copper wire, bulb holders, switches

SAFETY:

Use caution when working electricity, although the current from D cell batteries is not great enough to damage tissue.

CAUTION: DO NOT attempt **ANY** of these experiments using household voltages and current. Doing so could result in fire, injury or death.

Procedure:

Section 1: single component system

1. Complete the bulb/battery arrangement conception quiz.
2. Test your conceptions with one bulb, one battery, and one wire. Record (and remember!) pictures and observations of ALL attempts at lighting the bulb. See the following pages for short cuts in drawing circuits.
3. After this period, you must come up with FOUR different arrangements of the battery, bulb, and wire that will light the bulb.
4. In a few sentences, summarize the general conditions in which the bulb lit, and compare these with the conditions in which the bulb did not light. You could write this as a set of instructions for your family, telling them how to light a bulb in 4 different ways, and what will not work.
5. Keeping in mind your summary in step 4, try to draw a picture of the inside of a light bulb. To start, think about what a light bulb would look like if it were cut in half lengthwise (a cross section). Where are parts on the inside of the bulb connected to the outside of the bulb? Does your description incorporate your ideas from step 4?
6. After you have completed your drawing, show it to the instructor.
7. Now that you have an idea of how the bulb is lit, examine a typical bulb holder. Draw a cross section picture of the bulb holder, showing what is connected to what, and how it works.
8. Examine a switch. Connect the switch to one of the successful battery/bulb configurations, and observe what happens when the switch is opened and closed. How do your conclusions from 4 get incorporated into your observations for the switch?

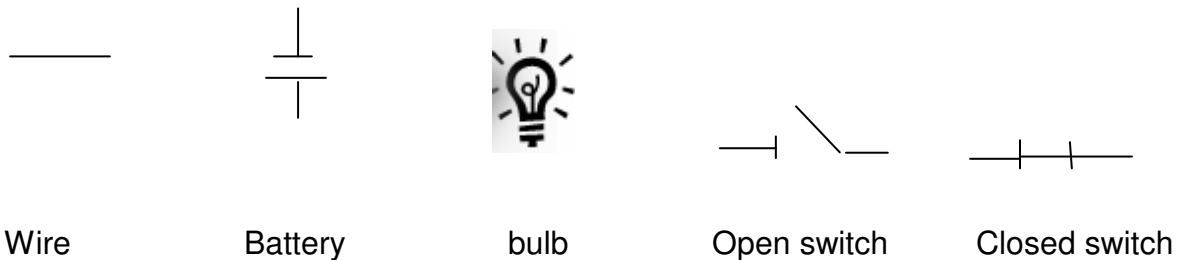
Section 2: A double component system

Now the task will be to investigate the configurations of multiple batteries or bulbs. You may use the bulb holders to aid in making connections.

9. Using one battery and 3 wires, prepare a working arrangement with two light bulbs. Record your observations (and a picture, of course).
10. Using one battery, prepare a completely different working arrangement with two light bulbs. Hint: try to use 4 wires. Record your observations, and compare with step 9.
11. Examine the two arrangements (called circuits) labeled "series" and "parallel" on the following pages.
12. Rebuild the series circuit, and simulate a bulb "burning out" by unscrewing one bulb. What happens to the other bulb? Record on data Sheet.
13. Rebuild the parallel circuit, and simulate a bulb "burning out" by unscrewing one bulb. What happens to the other bulb? Does this help you decide which type of circuit you have in your house?
14. Rebuild the series circuit and light the bulbs. Now place two batteries in series with each other, and observe the effect on the bulbs. Try this with the parallel circuit, and note any differences.
15. Using the series circuit, determine a battery configuration that prevents the bulbs from lighting.
16. At home, look at either a hair dryer or a toaster. Examine the heating elements and the power cord. Draw a picture or describe the electrical circuit that exists in the device in your lab report. Remember the safety warning, and do not investigate the appliance while it is plugged in.

Electronic Diagrams

In order to simplify your diagrams, you can use the following symbols that are common language for those people who design electronic devices.



Example #1:



Picture (single bulb, one battery)

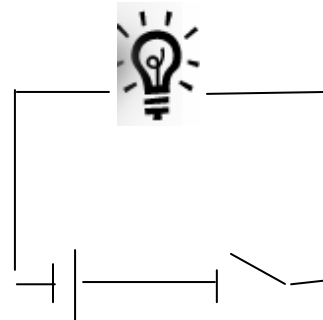
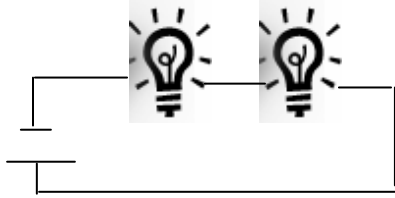


Diagram (circuit switch, battery, bulb)

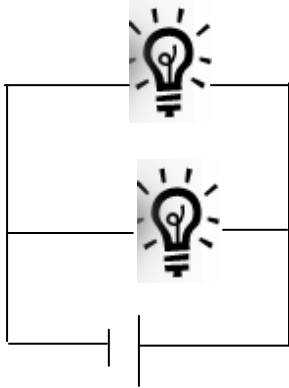
In the diagram, corners are squared to make things neater, and components are well separated for clarity. The key element is to show the correct connection pathway in an easily readable manner.

Example #2: Series circuit



Picture Diagram (two bulbs, one battery, in series) If one light goes out, the circuit is broken and the other will go out as well.

Example #3: Parallel circuit



Picture (two bulbs, one battery, in parallel) If one light goes out an alternate circuit is still available and the second light stays on.

Part B Internet Light Bulb Circuit

Go to the link <http://jersey.uoregon.edu/vlab/Voltage/index.html> and go through the exercises. Your task is to find a series of resistors and a battery that will light the light bulb without burning it out. You must drag the resistors into the simulator along the top wire and drag the right battery with the right voltage into the battery picture in the simulator. Then click “Try this circuit” to see if it works. If the bulb remains lit, cut-and-paste or sketch it in detail including numerical values used onto a sheet of paper with the date, the name of the lab, and your name on it and hand in along with the lab we do in class as on lab report.

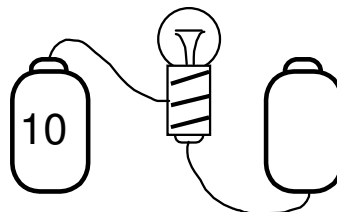
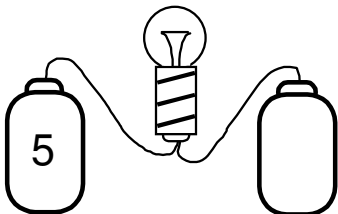
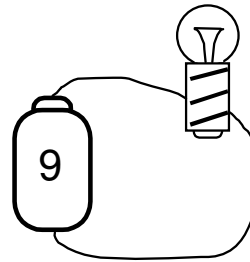
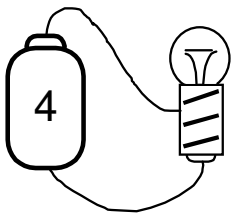
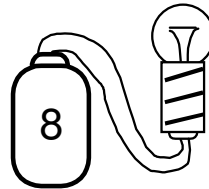
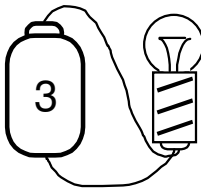
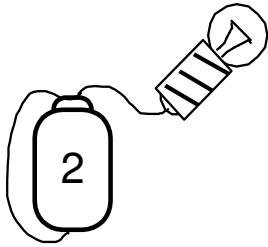
Experiment 6-Electric Light Bulb Experiment Report Sheet

Name: _____

Section: _____

Part A Section 1:

1. Please select the configurations(s) of battery, light bulb and copper wire that will produce light from the bulb. More than 1 correct answer is possible. Circle the circuits that work.



3. Draw the four circuits that you made and worked (lit up the bulb).

4. Summarize what is needed to light up a bulb.

5-7. Sketch the inside of a light bulb and a bulb holder in detail.

8. Observations of the use of a switch:

