Circuits Lab 1
Bulb, Battery and Wire

In this lab we begin our study of electricity by experimenting with what it takes to light a bulb, how different materials behave in regard to electricity and how basic electrical devices such as bulbs, sockets, switches and batteries are designed. We begin our study by connecting a battery and a bulb together and observing what happens. We investigate the conditions under which the bulb lights brightly, dimly, or not at all.

Lighting a Bulb with One Wire

Experiment 1.1

A) For each person in your group, obtain one battery, one light bulb and one wire. Connect these three items in as many ways as you can. Sketch each new way you connect the battery bulb and wire and note whether the bulb lights or does not light.

- Show four UNIQUE arrangements of the bulb, wire and battery for which the bulb lights. Be sure that someone could look at your sketch and tell where you are connecting the wires.

- Show at least two unique arrangements of the bulb, wire and battery for which the bulb does not light.

B) Describe what connection requirements must be met in order for the bulb to light. Please make your answer as concise but complete as possible. **(Your writing may be evaluated here!!)**

✓ *Check your progress with your instructor.*

Bulbs, wires and batteries are examples of **electrical components**. An arrangement of electrical components such as bulbs, batteries and wires is called a **circuit**.

Categorizing Materials Based on Electrical Properties.

Substances can be divided into categories based on their effect on an electric circuit.
In the following experiment we classify some common materials in this regard. For your entire group, get one battery in a holder, one bulb in a blue socket and two wires. Also get a small bag of assorted objects.

Experiment 1.2

A) Use the battery, bulb and wires to form a circuit in which the bulb lights. Then, disconnect one end of one of the wires from the battery. Insert one of the objects in your bag into the circuit by using it to connect the free end of the wire to the battery. (Think of the object as an extension of the wire.) Does the bulb light back up? Make a list of all the objects in your bag and insert each into the circuit noting whether the bulb lights or not.
B) Does electricity flow through plastic? How do you know?
C) Does electricity flow through metal? How do you know?

Materials which allow electricity to flow (the bulb lights) are called **conductors**. Materials which do not allow electricity to flow (the bulb does not light) are called **insulators**.

Exercise 1.3

Suppose you have a closed box from which two wires protrude. (You don't really have this box, just SUPPOSE you have it.) In 2-3 sentences, explain how to use a battery and a bulb to find out whether the two wires that protrude from the box are connected to each other inside or not. **(Your writing may be evaluated here!!)**

When two wires, or any two electric components, are connected so that electricity can flow between them we say there is an **electrical connection** between the components.

Experiment 1.4

Get a large bulb with the base cut open (one for each person in your group if possible). Note carefully how the wires in the glass part of the bulb connect to the metal base.

A) Exactly where do the two ends of the filament wire connect to the metal base of the bulb? For example, do both ends of the filament wire connect to the side of the metal base? Or, do both ends connect to the metal tip at the bottom of the bulb? Or does one end of the filament wire connect to the side of the metal base and one end connect to the bottom of the metal base?
B) Draw the bulb wiring in as much detail as possible and note on your drawing which parts of the bulb are insulators and which are conductors.

✓ **Check your progress with your instructor.**

Experiment 1.5

A) Carefully examine the round, blue bulb socket. Draw the socket and label the conducting and insulating parts.
B) Connect the bulb (in the socket) and battery in a circuit so that the bulb lights. Draw the circuit and indicate the path of the electricity in as much detail as possible.

Exercise 1.6

Consider the following dispute between two students:

Student 1: *"When a bulb is screwed into a socket the very bottom tip of the bulb makes electrical contact with a conductor on the socket and electricity flows into and out of the bottom tip of the bulb. The metal strip that the bulb screws into just holds the bulb in place. "*

Student 2: *"I disagree. The metal strip that the bulb is screwed into allows electricity to flow into and out of the side of the bulb. The bottom tip of the bulb just keeps the bulb together.*

Do you agree with student 1, student 2, parts of both or neither one? Explain how you think a socket works. **(Your writing may be evaluated here!!)**

✓ **Check your progress with your instructor.**