

SECTION 2

B Section 2

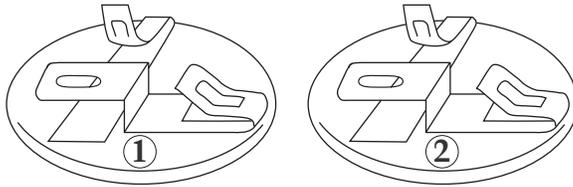
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ELECTRICAL CIRCUITS

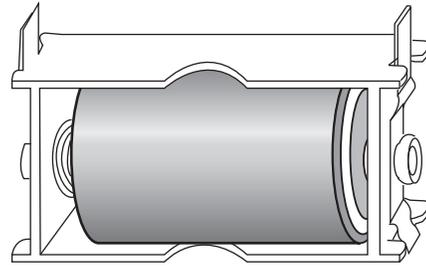
For this task, you received a kit that contains materials you will use to perform investigations and solve a mystery during the next 40 minutes.

Please open your kit now, take all of the things out of the bag, and put them on your desk. Use Diagram 1 to check that all of the materials in the diagram are included in your kit. If any materials are missing, raise your hand, and someone will provide you with the materials you need.

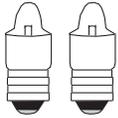
Diagram 1



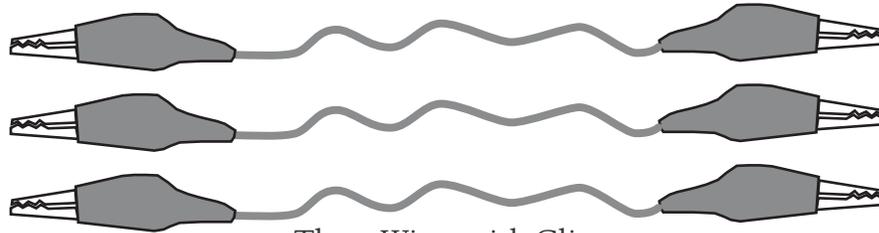
Two Light Bulb Holders



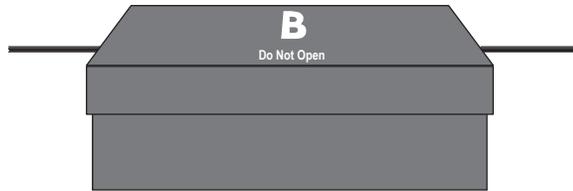
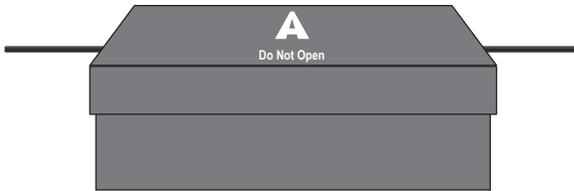
Battery in Holder



Two Light Bulbs



Three Wires with Clips



Two Boxes with Wires Sticking Out



Toothpick



Straw



Paper Clip



DO NOT USE THE MATERIALS OR READ ANY FURTHER UNTIL THE ADMINISTRATOR TELLS YOU TO DO SO.



B Section 2

In this task you will perform investigations using electrical circuits. At the end of this task, you will use what you have learned to solve a mystery about a hidden light bulb.

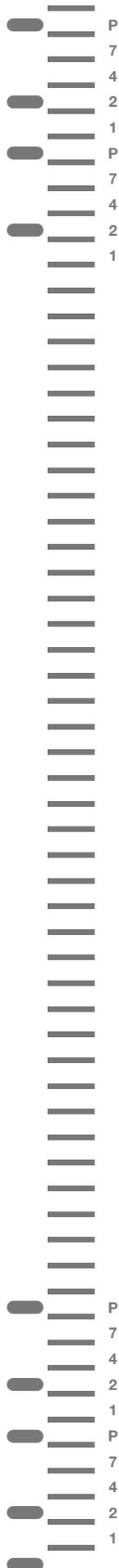
This task contains the following four parts:

- Part 1: Learning to Assemble an Electrical Circuit
- Part 2: Designing Your Own Circuit
- Part 3: Designing a Different Circuit
- Part 4: Investigating Unknown Boxes

You will be scored on how well you

- design your investigations,
- record your observations, and
- answer questions based on your investigations and your knowledge about electrical circuits.

Follow the directions on each page and write your answers to the questions in the spaces provided in your booklet.

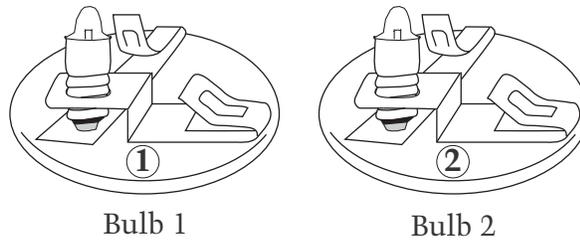


You will now place the light bulbs in their holders.

Take the light bulb holder labeled 1. Place one of the light bulbs into the holder. Twist the bulb until its bottom touches the bottom metal part of the holder as shown in Diagram 2.

Take the light bulb holder labeled 2. Place the other light bulb into the holder. Twist the bulb until its bottom touches the bottom metal part of the holder as shown in Diagram 2.

Diagram 2



Holder 1 and its light bulb will be called Bulb 1.

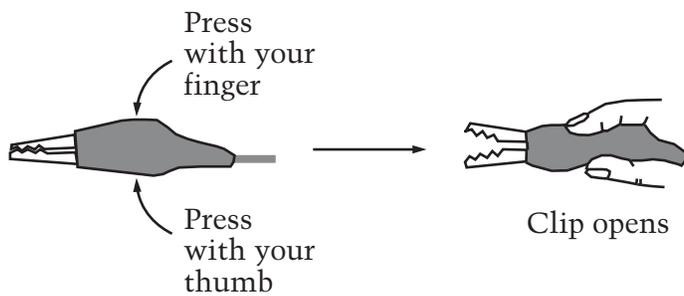
Holder 2 and its light bulb will be called Bulb 2.

Make sure you keep the light bulbs in their holders for the rest of the task.

You will now learn how to use the clips at the end of the wires.

Take one of the wires with clips at the end. If you press down on the wide part of the clip, the clip will open, as shown in Diagram 3 below. You can then clip the wire onto things. If the black cover of the clip slips off, raise your hand, and you will be given a new wire with clips.

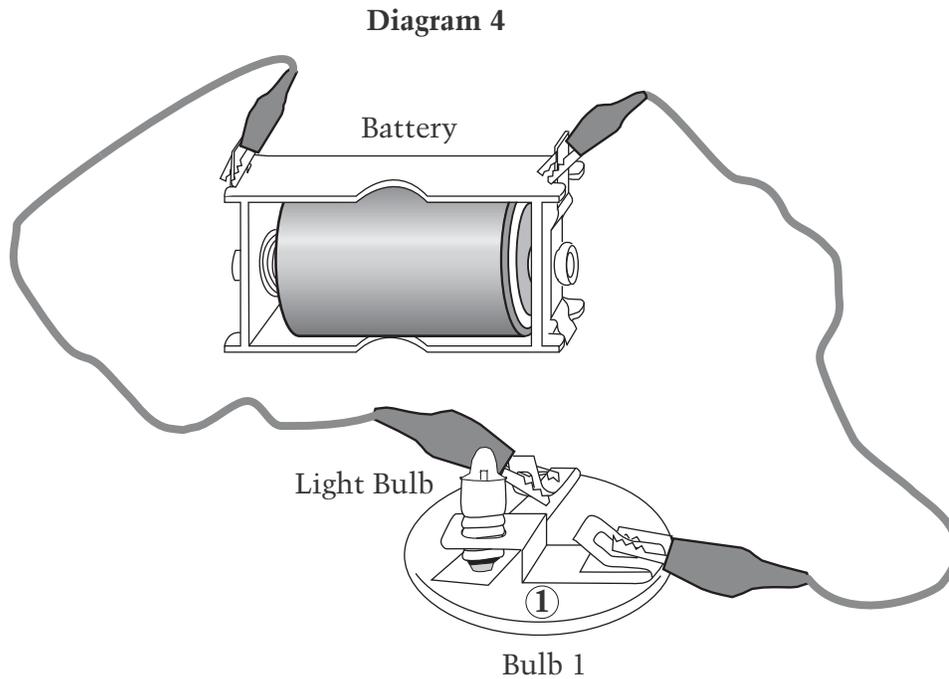
Diagram 3



PART 1

You will now test Bulb 1 and Bulb 2 to make certain that they both light up. You will also answer a question about electrical circuits.

First, look at the electrical circuit shown in Diagram 4 below. Now, make a circuit using Bulb 1 that looks like the one shown in Diagram 4.



Does Bulb 1 light up? (You may need to look straight down from the top to observe the bulb clearly.)

- Ⓐ Yes
- Ⓑ No

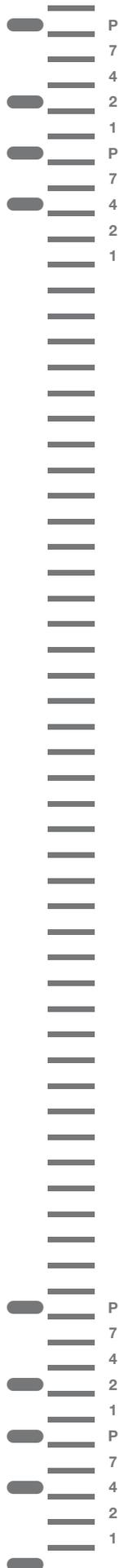
If Bulb 1 does not light up, raise your hand and someone will help you.

Now remove Bulb 1 (in its holder) from the circuit by unhooking the clips. Put Bulb 2 (in its holder) into the circuit to make certain that Bulb 2 works.

Does Bulb 2 light up? (You may need to look straight down from the top to observe the bulb clearly.)

- Ⓐ Yes
- Ⓑ No

If Bulb 2 does not light up, raise your hand and someone will help you.



PART 2

2. You will now design an investigation to find out which of three objects (straw, toothpick, and paper clip) will conduct electricity.
- Open the packet containing the straw, toothpick, and paper clip.
 - You may use any of the materials in your kit except Box A and Box B. These will be used in Part 4 of the task.

Before you test the three objects in your circuit, predict which of the three objects will conduct electricity. (You may fill in more than one oval.)

- Ⓐ Straw
- Ⓑ Toothpick
- Ⓒ Paper clip

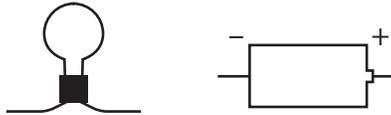
Explain how you know using your knowledge of what types of materials conduct electricity.



3. Decide how you will place each object into your circuit to find out if the object conducts electricity. Draw and label a diagram of your circuit in the box below. You may use symbols for the parts of your circuit, as shown below.

Do not worry about how well you draw.

Diagram 5



A large empty rectangular box with a thin black border, intended for the student to draw their circuit diagram.

4. Now, test all three objects and write down what you observed in Table 1 below.

TABLE 1: OBSERVATIONS

| Object | What Did You Observe? |
|------------|-----------------------|
| Straw | |
| Toothpick | |
| Paper clip | |



PART 3

You will now investigate if adding a second bulb to the circuit shown in Diagram 4 will affect the brightness of the bulbs.

Diagram 4 (reprinted below from page 6) shows a circuit with one bulb (Bulb 1). Diagram 6 on the next page shows a circuit that includes a battery and two light bulbs in a row (Bulb 1 and Bulb 2).

Diagram 4

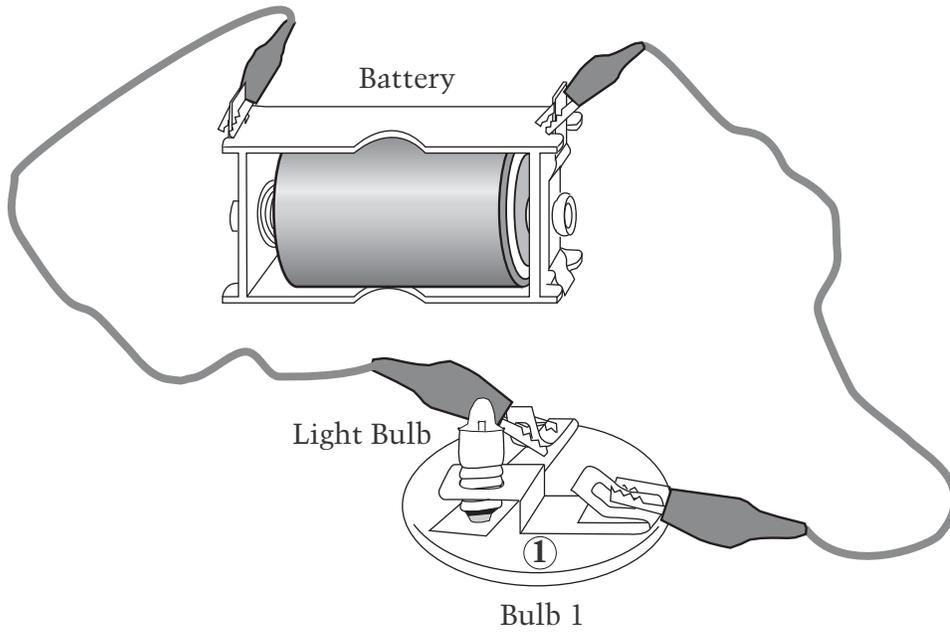
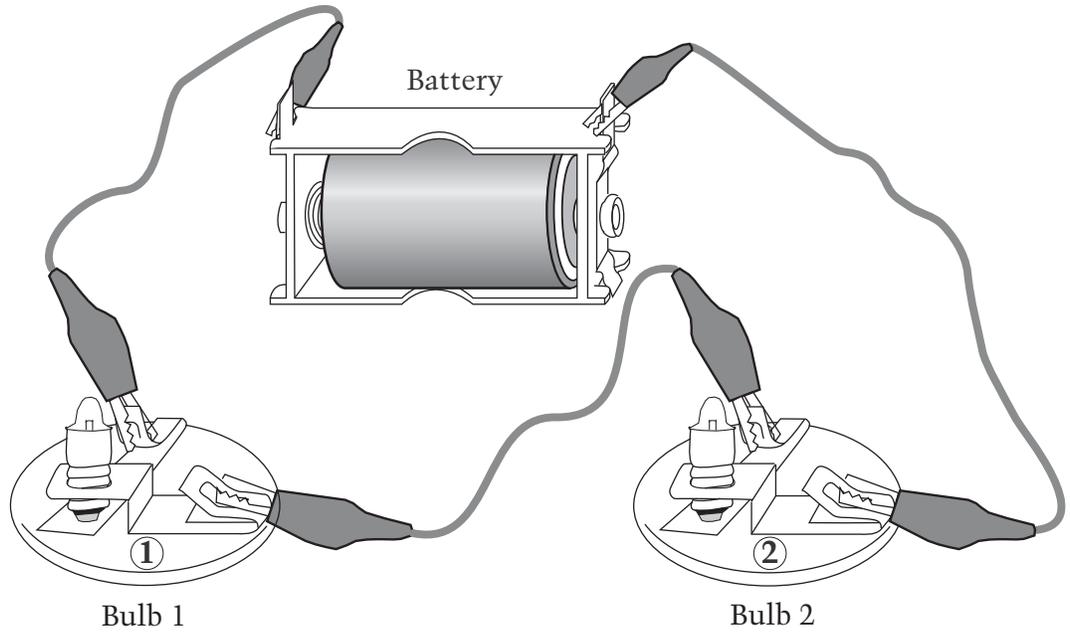


Diagram 6



6. Now set up a circuit like the one shown in Diagram 6 (with Bulb 1 and Bulb 2). Remember that you may need to look straight down from the top to see Bulb 1 and Bulb 2 clearly.

What did you observe about the brightness of Bulb 1 using two bulbs in your circuit compared to the brightness of Bulb 1 using one bulb in the circuit?

Explain what you think was happening in the circuit.

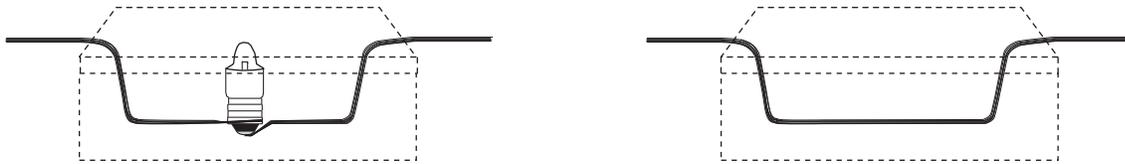
PART 4

You will now apply what you have observed so far about electrical circuits to solve a problem about a hidden light bulb.

You have been given two boxes. **These boxes are sealed and cannot be opened.** One is labeled A, and the other is labeled B.

Each box has a piece of wire coming out of two of its sides. In one box, the two wires are connected to a light bulb inside the box. In the other box, there is only a wire inside the box, as shown below.

Diagram 7



7. You will find out which box (A or B) contains the light bulb and which box contains only a wire. You may use any of the materials in your kit.

Now test the two boxes.

Draw a diagram in the spaces below to show how you set up your circuit to find out what was in each box. Be sure to label your diagrams. Remember that you may use symbols for the parts of your circuit.

Do not worry about how well you draw.

Circuit with Box A



Circuit with Box B

