Name_____ Period_____ Date_____

CONCEPTUAL PHYSICS | **Activity**

35.1 Electric Circuits: A Battery and a Bulb

BATTERIES AND BULBS

Purpose

In this activity, you will explore various arrangements of batteries and bulbs, and the effects of those arrangements on bulb brightness.

Required Equipment and Supplies

2 D-cell batteries
4 connecting wires
2 miniature bulbs (1.5-volt or 2.5-volt flashlight bulbs)
2 miniature bulb sockets

Discussion

Many devices include electronic circuitry, most of which are quite complicated. Complex circuits are made, however, from simple circuits. In this activity you will build one of the simplest yet most useful circuits ever invented—that for lighting a light bulb!

Procedure

Step 1: Remove the bulb from the mini socket.

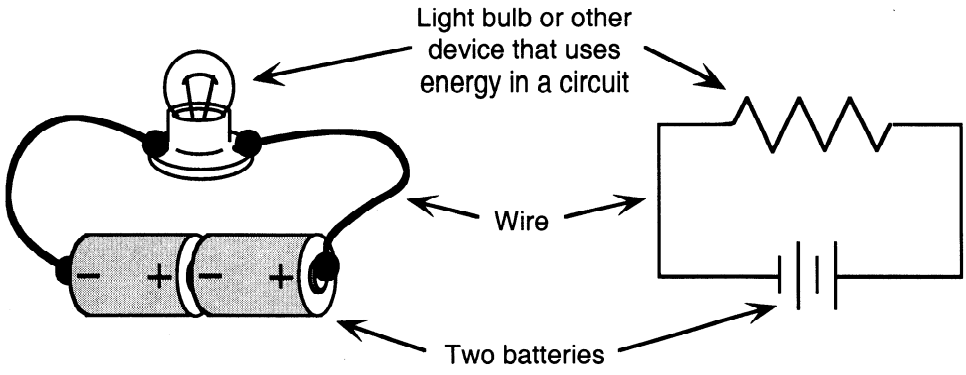
1. On a separate sheet, draw a detailed diagram of the bulb, showing the following parts of the bulb's "anatomy."
   - glass bulb
   - filament leads (tiny wires that lead to the filament)
   - screw base
   - base contact (made of lead)
   - lead separator (glass bead)

2. There are four parts of the bulb's anatomy that you can touch (without having to break the bulb). Two of them are made of *conducting* material (metal) and two are made of *insulating* material. List them.

   Conducting parts on the outside of the bulb:_____

   Insulating parts on the outside of the bulb:_____

Step 2: Examine the two diagrams of a working electric circuit shown below. The diagram on the left shows pictorial representations of circuit elements. The diagram on the right shows symbolic representations. Use the symbolic representations in the steps that follow.



Using a bare bulb (out of its socket), one battery, and **two** wires, try lighting the bulb in as many ways as you can. On a separate sheet, sketch at least two *different* arrangements that work. Also sketch at least two arrangements that don't work. Be sure to label them as "works" or "doesn't work."

Step 3: Using a bare bulb (out of its socket), one battery, and **one** wire, try lighting the bulb in as many ways as you can. Sketch your arrangements and note the ones that work.

3. Is it possible to light the bulb using the battery and **no** wires? Explain.

Step 4: Connect one bulb (in its socket) to two batteries as shown in Figure B. This arrangement is often referred to as a *simple* circuit.

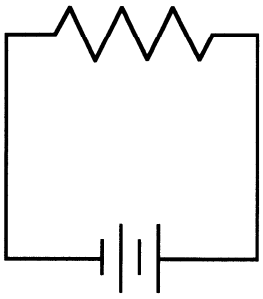


Figure A. Simple circuit

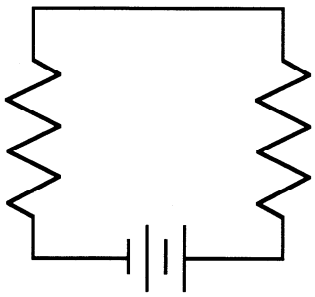


Figure B. Series circuit

Step 5: Connect the bulbs, batteries, and wire as shown in Figure B. When the bulbs are connected one after the other like this, the result is called a *series* circuit.

4. How does the brightness of each bulb in the series circuit compare to the brightness of the bulb in a simple circuit?

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5. What happens if one of the bulbs in a series circuit is removed? (Do this by unscrewing a bulb from its socket.)

Step 6: Connect the bulbs, batteries, and wire as shown in Figure C. When the bulbs are connected along separate paths like this, the result is called a *parallel* circuit.

6. How does the brightness of each bulb in the parallel circuit compare to the brightness of the bulb in a simple circuit?

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7. What happens if one of the bulbs in a parallel circuit is removed?

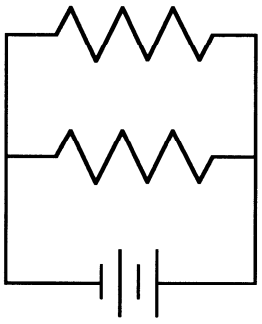

Figure C. Parallel circuit

Summing Up

1. With what two parts of the bulb does the bulb socket make contact?

2. What do successful arrangements of batteries and bulbs have in common?

3. How do you suppose most of the circuits in your home are wired—in series or in parallel? What is your evidence?

4. How do you suppose automobile headlights are wired—in series or in parallel? What is your evidence?