Name_____ Period_____ Date_____

CONCEPTUAL PHYSICS | **Activity**

35.2 Electric Circuits

BE THE BATTERY

Purpose

In this activity, you will provide energy to an electric circuit using your own muscle power.

Required Equipment and Supplies

hand-held generator (Genecon® or equivalent)
3 miniature bulbs (6-volt flashlight bulbs)
3 miniature bulb sockets
6 connecting wires

Discussion

Batteries last longer in some circuits than they do in others. They last longer when they don't have to "work" so hard. In this activity, ***you*** will do the work of the battery. That is, you will power a circuit using the hand-held generator. You will learn which circuits are easier to power and which circuits are harder to power. And you'll gain a better appreciation for what batteries and the local power utility do for you all the time!

Procedure

Step 1: Arrange a simple circuit using the generator and a bulb in its socket as shown in Figure 1. Gently crank the handle to make the bulb light up. Take care not to crank the generator too quickly and don't give it any sudden jerks or bursts of motion.

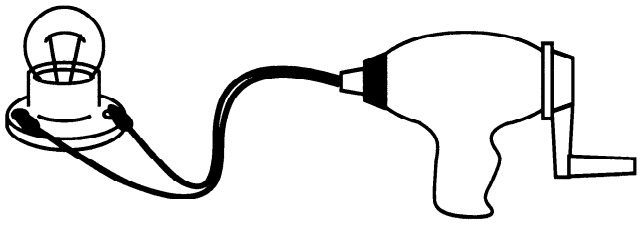

Figure 1. The hand-powered circuit

1. When the bulb is lit, how can you make it brighter? Does this require more effort on your part?

Step 2: While cranking the generator and lighting the bulb, have a partner unscrew the bulb from the socket as shown in Figure 2.

2. What happens to the cranking effort when the bulb is unscrewed from its socket?

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3. When the bulb is removed from the socket, is the resulting circuit an open circuit or a short circuit?

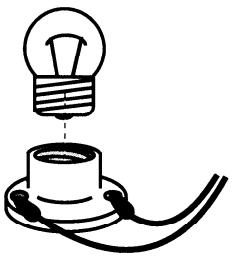

Figure 2

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4. Is the electrical resistance in this kind of circuit very high or very low?

Step 3: Remove the generator leads from the bulb terminals and connect them to each other as shown in Figure 3.

5. What happens to the cranking effort when the generator leads are connected to each other?

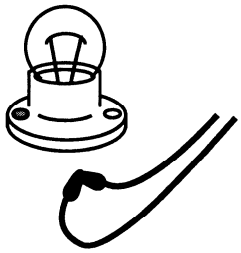

Figure 3

6. When the generator leads are connected directly to each other, is the resulting circuit an open circuit or a short circuit?

7. Is the electrical resistance in this kind of circuit very high or very low?

Step 4: Connect three bulbs in series as shown in Figure 4. Gently crank the handle to make the bulb light up. Get a sense of how much effort is needed to power the circuit.

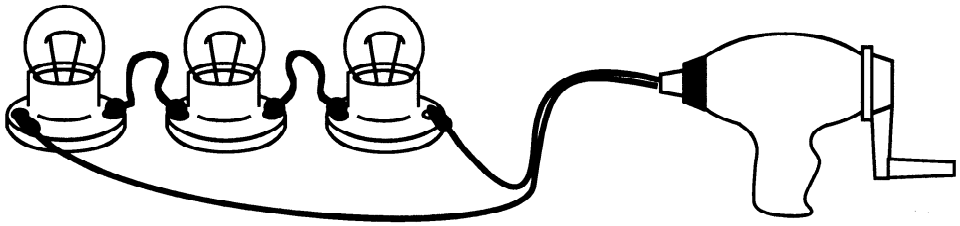

Figure 4. A hand-powered series circuit

Step 5: Connect three bulbs in parallel as shown in Figure 5. Gently crank the handle to make the bulb light up. Get a sense of how much effort is needed to power the circuit.

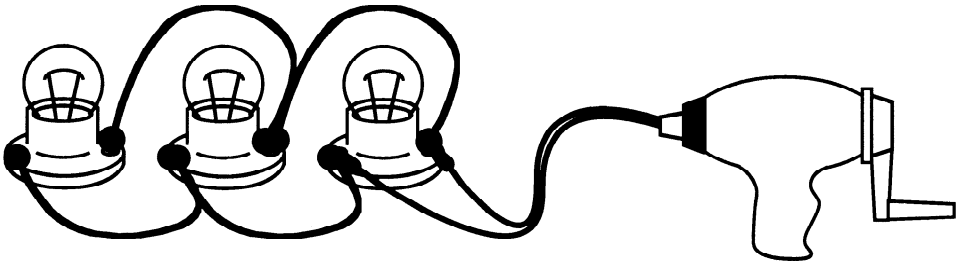

Figure 5. A hand-powered parallel circuit

8. Which circuit is harder to power, the series circuit or the parallel circuit?

Summing Up

1. Which types of circuits are harder to power, those having low electrical resistance or those having high electrical resistance?

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2. Which arrangement of three bulbs has more electrical resistance, series or parallel? Justify your answer using observations from the activity.

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3. Under which conditions will a battery run down faster, when connected to a high-resistance circuit or when connected to a low-resistance circuit?

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4. Which battery would last longer, one connected to three-bulbs series circuit or one connected to three-bulb parallel circuit? (Assume the batteries are identical and the bulbs are identical.)
