Generate Power with simpleGEN

Usually we rely on batteries or power outlets to get electrical power for the things we use every day. The electricity from power outlets may come from generators at a power plant or wind farm, and sometimes during a power outage people use gasoline-powered generators. All generators require coiled wire for electrons to flow through and a magnetic field that is made to change through rotational motion. Sometimes it is the wire that rotates, and sometimes it is the magnet that rotates. In this activity, you will build a generator.

OBJECTIVES

Build and test an electrical generator.



Figure 1 KidWind simpleGEN

MATERIALS

From the KidWind simpleGen:

2 generator housing halves

6 screws

28-gauge magnet wire on spool

magnet holder

4 ceramic magnets

4″ hex shaft

sandpaper ⅛ sheet

digital multimeter

simpleGEN User Manual

red LED

bipolar LED

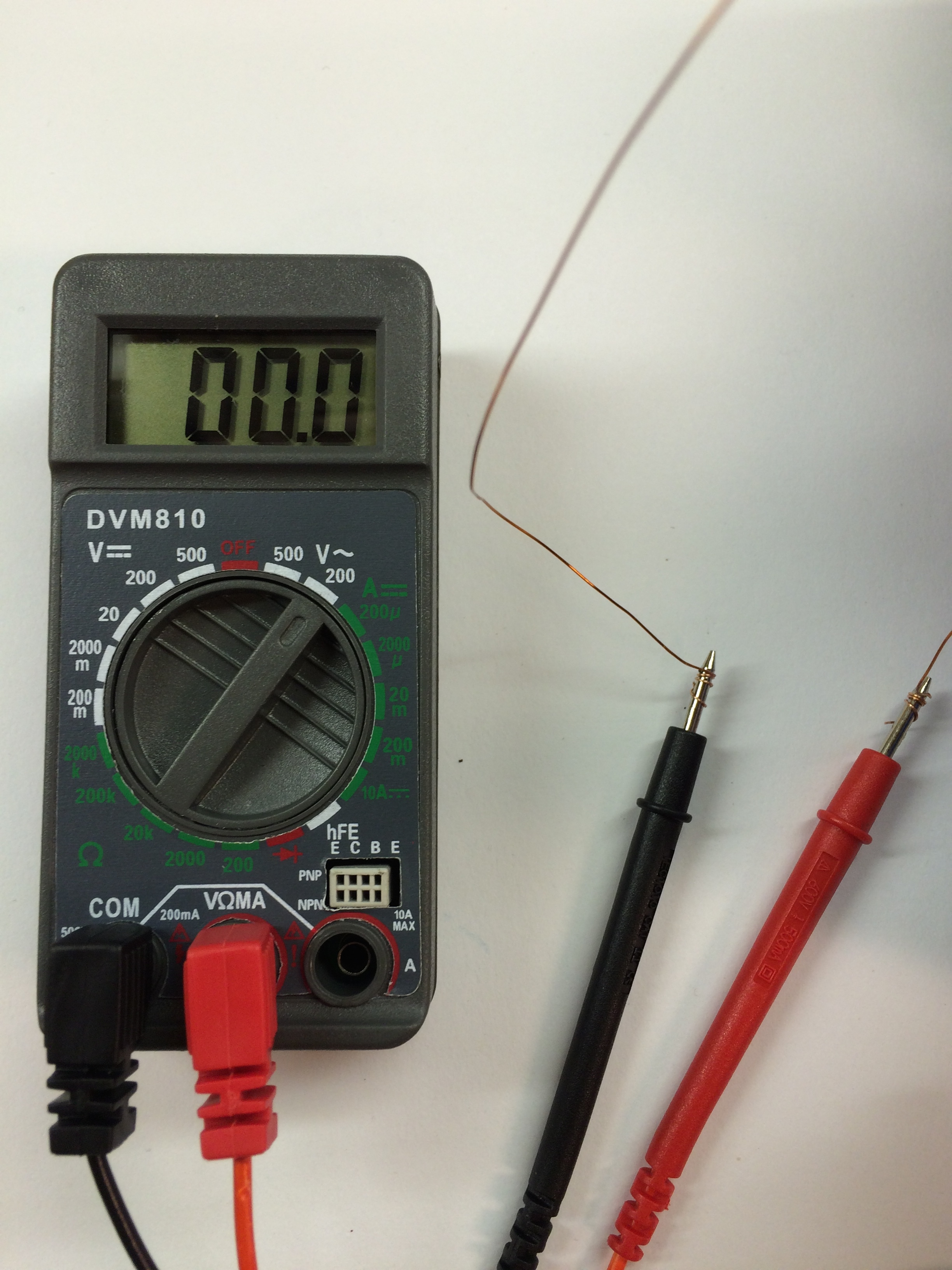
Additional equipment:

power drill

small incandescent light bulb cut from a string of holiday lights (optional)

Procedure

1. Assemble the generator as described in the User Manual supplied with the KidWind simpleGEN. The instructor may assign a number of turns of wire or a number of magnets to use. Record the number of turns of wire above the data table. Make sure you sand the ends of the wire so that there is no enamel on the last 2 cm of each wire end.

2. Connect the two ends of the generator wire to the two terminals of the digital multimeter. Set the multimeter to measure alternating voltage, as shown in Figure 2.

*Figure 2*

3. Spin the hex shaft with your fingers while watching the display on the multimeter. Try to spin the shaft as fast as you can. Record the voltage reading in the data table.

4. Spin the hex shaft with a drill. Spin the shaft as fast as is possible with the drill. Record the voltage reading in the data table.

5. Attach one of the LED bulbs to the two wire ends. Bend the “legs” of the LED apart to make sure they will not touch each other.

6. Spin the generator shaft with your hands and try to light the LED bulb. Then, use the drill to spin the shaft. Record your observations in the data table

7. *Optional*: Use a small incandescent light bulb cut from a string of holiday lights. Make sure it is an incandescent bulb, since many holiday lights are LED bulbs. Carefully remove the plastic coating from the ends of the wires (about 1 cm is sufficient). Attach the generator wire ends to the light bulb wires. Again, spin the generator shaft using your hands and using the drill. Record your observations.

8. Discuss your results with your classmates. Make a chart of the highest voltage each group was able to generate and the number of turns of wire and number of magnets in each group’s generator.

Analysis

Total number of turns of wire: \_\_\_\_\_\_\_\_\_ Number of magnets in holder:\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
|  | Spinning shaft by hand | Spinning shaft with drill |
| Maximum voltage reading |  |  |
| Can you light an LED? |  |  |
| Can you light an incandescent bulb? |  |  |
| Additional observations |  |  |

Analysis questions

1. Based on your discussion with your classmates, how does the number of turns of wire affect the maximum voltage generated?

2. List some ways you could change the construction of the generator, and speculate how these changes might affect the maximum voltage you can generate.

EXTENSIONS

1. Repeat the experiment with only two magnets. In order to perform this experiment, you will need to shim the remaining magnet on each side of the magnet holder with cardboard cut to fit. Make sure each side is tight enough to stay in the holder when turned.

2. There will be a difference in how the light looks when you compare the LED bulb to the incandescent bulb. Do some research to discover how to account for the difference.   
**Hint**: The generator you built generates AC power.