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Wind Power - Pop Bottle Windmills

Additional Information

Demonstration I - Electromagnetism

This simple demonstration can be used to accompany a lesson on electromagnetism. It can be used as an introduction to a discussion of how electric generators work.

The following items will be needed for this demonstration:

- 2 ft. of string
- bar magnet
- battery
- 20 in. of copper wire
- nail
- tape

Step 1

Tie the string around the centre of the bar magnet.

Step 2

Loop the wire around the nail, creating a coil, but be sure to leave a two inches of wire at both ends in order to touch the terminals of the battery.

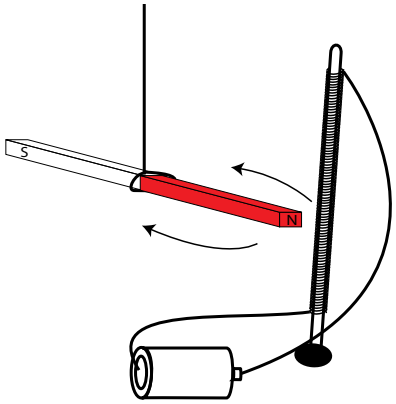

Figure 1

Step 3

Tape one end of the wire to one battery terminal while leaving the other end of the wire loose, creating an open circuit. Place the circuit on a flat surface.

Step 4

Hold up the string so that the bar magnet hangs near the nail. Touch the loose wire end to the free battery terminal, closing the circuit (**Figure 1**). The magnet should begin to spin in order to align itself with the electric current in the coil. This demonstration shows the relationship between electricity and magnetism, and can be used to explain how a generator works. In the case of the windmill, a spinning magnet generates an electric current. A detailed explanation of how the windmill generator works can be found in the *WOW Lab Wind Power Video*.

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Demonstration II - Parallel and Series Circuits

This demonstration is a helpful visual tool to accompany a discussion on the voltage and current in parallel and series circuits. The wind farm is made up of numerous windmill generators and students should realize that the way in which these generators connect to each other can alter the voltage and electric current output of the farm.

In addition to the materials listed in the *Prep Instructions*, the following items will be needed for this demonstration:

- flashlight bulb and holder
- two batteries
- six wire leads with alligator clips on each end
- multimeter

Step 1

Using the alligator clips, wire a battery, the lightbulb, and the multimeter together (**Figure 2**). Record the voltage and the current. This gives a measure of the current and voltage output of a single battery. Calculate the power output of the battery.

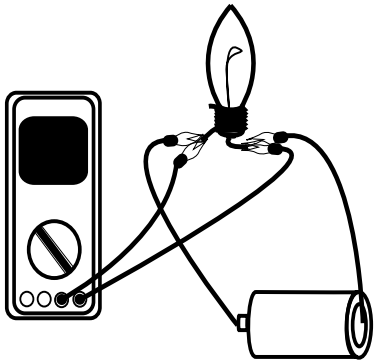

Figure 2

Step 2

Now wire two batteries together in series and connect it to the light bulb and multimeter (**Figure 3**). Measure the voltage and current. Ask the students what they expect the total power of the circuit is now that there are two batteries. Calculate the total power output.

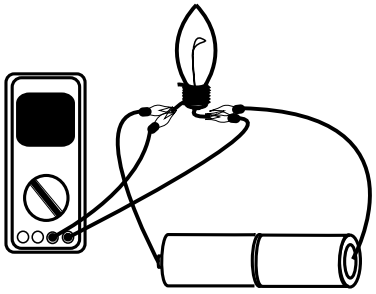

Figure 3

Step 3

Now connect two batteries and the light bulb in parallel. Attach the multimeter to the leads of the light bulb (**Figure 4**). Record the voltage and the current. Ask the students what they think the power output should be now.

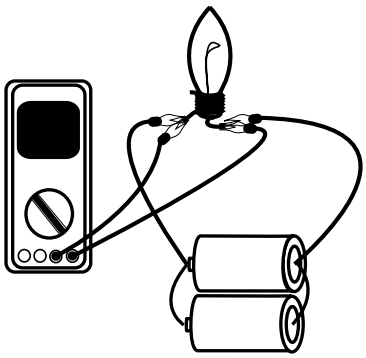

Figure 4