

Activity 9

Variable Resistor

Materials

- GENECON with output cord
- 1 Bulb (3.8V, .3A) in socket with leads
- Nichrome coil
 - o Pencil

Procedure

1. Connect one lead from the GENECON to one end of the nichrome coil. The other lead should be attached to one of the leads from the bulb. The remaining lead from the bulb can then be connected to the opposite end of the nichrome coil (see sketch below).
2. Rotate the handle of the GENECON at a constant speed and observe the brightness of the bulb.
3. While continuing to operate the GENECON at a constant speed, have another student **slide** the lead from the bulb back and forth along the length of the nichrome coil. Observe the effect on the brightness of the bulb.

Key Concepts

1. Resistance to the flow of the electricity by a conductor increases with the length of the conductor; i.e., resistance is directly proportional to the length.
2. Observed changes in the brightness of the bulb reflect corresponding changes in the voltage supplied to the bulb.
3. The nichrome wire in the activity serves as a variable resistor or **rheostat** (a device for adjusting the current supplied to an appliance).



Teaching Tips

1. For an interesting variation of this activity, you will need a pencil. The teacher should expose the entire length of graphite core by cutting away the top layer of wood.
2. The length of graphite may then be substituted for the nichrome coil in the procedure described above, with similar results.
3. Pencil "lead" is really made of graphite, a form of carbon which is a conductor of electricity.

Activity 10

The Thermal Effect

Materials

- GENECON with output cord
- Exoergic Experiment Device
- Thermometer
- Nichrome wire

Procedure

1. Connect the leads on the GENECON to the Exoergic Device (a resistor combined with a liquid crystal thermometer).
2. Note the temperature in degrees Celsius on the liquid crystal scale. The correct temperature is the green number. If two numbers are equally vivid, the temperature is the odd number in between.
3. Rotate the handle of the GENECON at a steady rate for about 60 seconds. Read the temperature again.
4. For another simple variation of this activity, tightly wrap a 25 cm length of nichrome wire. Have a student record the initial temperature and then turn the handle of the GENECON briskly for about 20 seconds. Note the change in temperature.

Key Concepts

1. The mechanical energy required to operate the GENECON is converted into electrical energy which in turn is changed into thermal (heat) energy by the resistor in the Exoergic Device.
2. In the case of the nichrome wire, the heat from the internal resistance of the wires causes the liquid in the thermometer bulb to expand and move upward resulting in a higher reading on the thermometer scale.

Teaching Tips

1. The "thermal effect" which is observed and measured in this investigation is useful in explaining the operation of electric toasters and other electrical heating appliances.
2. This is a good place to remind students that much of the energy "lost" (see Activity #3) in energy transformations is in the form of heat.
3. The next activity (Short Circuits and Fuses) builds upon the concepts developed here.

