



## Curiosity Guide #604

### Electric Lights

Accompanies Curious Crew, Season 6, Episode 4 (#604)

#### Lighting LEDs

Investigation #5

#### Description

Did you know that LEDs are "Light-Emitting Diodes?" Find out how LEDs emit light!

#### Materials

- Assorted 3mm and 5mm LED Diodes and resistors
- DC Power Supply
- 2 alligator clips

#### Procedure

- 1) Closely examine an LED bulb.
- 2) What do you notice?
- 3) Plug in the power supply.
- 4) Connect the two alligator clips to the unit.
- 5) Attach the positive lead to the long LED leg and the negative lead to the short one.
- 6) Slowly turn up the power, keeping the current dial low, and dial up the voltage to about 0.03 or 30 milliamps.
- 7) What do you notice?
- 8) What happens if you switch the leads?
- 9) Experiment with LEDs of different voltages.
- 10) Try a 3-volt. Slowly dial the 3-volt up.
- 11) At what voltage do you see the 3-volt give off light?

12) Try different colored LEDs. Are the volts the same to get the colored lights on?

My Results

Explanation

LEDs, or light emitting diodes, are a more efficient way to produce light than is a standard incandescent bulb. LEDs are made by sticking two semiconductors together. When the semiconductors encounter electricity, they make light. This process is called electroluminescence. Even though some heat results, most of the energy is transferred as light.

Most LED lights can last as long as ten years running continuously. Many of today's flashlights, streetlights, and household bulbs use LED lights.

It's important to connect the LED in the proper way in the circuit. Notice how one leg of the LED is longer. This longer leg is the anode, while the shorter leg is the cathode. The case itself is also filed down on the cathode side. Current flows into the anode side, so this leg should be connected to the positive side of the battery. The cathode connects to the negative side. If the LED is hooked up backwards, the LED won't work.

For the LED to work, there also must be the right amount of forward voltage, with a variance of about .2 volts when a light will work. Colored LEDs have differing amounts of forward voltage. Red is 2 volts, yellow 2.1, green 2.2, blue 3.5, and white 3.2 volts. Exposing the LED to too much voltage by increasing the current flow will cause the light to quickly burn out. Therefore, a 9-volt battery will destroy small LED bulbs. Resistors serve the same purpose as the electric power supply by limiting the flow of electricity. Therefore, to connect a 9-volt battery's positive lead to a resistor and then to the anode side of a 3-volt white LED, you would need to protect the LED with a 6-volt resistor or 300 ohms.

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